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ECONOMIC TECHNIQUES FOR ESTIMATING RESOURCE VALUES AND ANALYZING IMPACTS DURING BLM WILDERNESS STUDIES

Bureau of Land Management

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CREDITS

This reference guide is drawn primarily from a paper entitled, "Economic Techniques for Estimating Resource Values and Analyzing Impacts During BLM Wilderness Studies", prepared by John B. Loomis and Richard G. Walsh of Colorado State University in January 1982. The techniques selected, examples cited and references were assembled in the Loomis and Walsh paper. The Bureau of Land Management is most appreciative of the research and analyses provided by Mr. Loomis and Dr. Walsh in developing the foundation for this reference document.

TABLE OF CONTENTS

Page

I. Introduction 1

II. Discussion of Concepts 6

III. Techniques for Estimating Resource Values 23

A. Estimating Recreation Use 23

1. Current and Future Use Estimated by Extrapolation From Other Areas or Studies 25
2. Jungst Wilderness Recreation Use Equation 31
3. Trend Line or Time Series Regression Analysis 36
4. Similar Site Travel Cost Method for Use Estimation 39
5. Site Specific Travel Cost Method for Use Estimation 48

B. Estimating Recreation Dollar Benefits 53

1. Extrapolation from Other Areas or Studies 53
2. Resources Planning Act (RPA) Values 58
3. U.S. Water Resources Council Unit Day Value (UDV) Method 60
4. Similar Site Travel Cost Method for Benefit Estimation 66
5. Site Specific Travel Cost Method for Recreation Benefit Estimation 72

C. Estimating Grazing and Livestock Values 76

1. Resource Planning Act (RPA) Values 76
2. Private Land Lease Rates 78
3. Change in Net Income 79

D. Estimating Timber Values 80

E. Estimating Mineral Values 81

1. Probability Analysis with GEM Technical Report 83
2. Probability Analysis - Computer Simulation 88
3. Alternative Cost Techniques 89

TABLE OF CONTENTS (continued)

Page

IV. Techniques for Evaluating the Local Income and Employment Effects 92

A. Expenditure Data by Resource 93

1. Wilderness Recreation 93
2. Dispersed Recreation 94
3. Wildlife Recreation 95

B. Techniques 98

1. Bureau of Economic Analyses - Water Resources Council Regional Multipliers 99
2. U.S. Forest Service IMPLAN 101
3. Colorado State University Input-Output Models and Multipliers 104

V. References 107

Appendix 1: Bureau of Economic Analysis - Water Resources Council Support Data and Multipliers 116

Appendix 2: Calculator Program for Using the Jungst Equation 134

INTRODUCTION

The purpose of this document is to outline economic techniques which could be used during the Bureau of Land Management's (BLM) wilderness studies to: (1) develop estimates of resource values; and (2) determine impacts of wilderness designation or nondesignation on local economies. The user is not required to employ the techniques presented, rather they are presented as some acceptable analytical techniques which the analyst may find appropriate to use.

As a general rule the results from using an analytic technique can be no better than the quality of the data that are put into the technique. The first order of importance in the BLM wilderness studies is to develop basic data of acceptable quality on wilderness characteristics, recreational use and commodity production under two scenarios: with wilderness designation and without wilderness designation. If the user can develop some basis in fact for the raw data, then there is a defensible basis for considering the use of these analytic techniques. The reader is referred to the BLM Wilderness Study Policy (1982) for guidance on the required informational content of a BLM wilderness study. The repeated emphasis on "values" in the study policy is not meant to imply that all values are economic values which are to be developed and presented in dollars and cents. However, wherever feasible, a value expressed as a numerical quantity (user days, acres, board feet, animals harvested,) is preferrable to a value expressed qualitatively (rare, extremely rare) or ordinarily (more than, less than).

The BLM Wilderness Study Policy states that areas recommended as suitable for wilderness designation should possess wilderness values (Criterion 1, Components 1 and 2) and multiple resource benefits (Criterion 1, Component 3) capable of balancing the benefits of other resource values and uses which would be foregone due to wilderness designation. This statement does not mean that a monetary benefit-cost analysis is required. It does mean that sufficient numerical, qualitative, and ordinal information is presented to support the recommendation, on balance, of the study. The principal context for a balancing analysis is the with and without comparison. The balancing analysis must provide information on the benefits and costs of the situation in which wilderness is designated and the situation in which wilderness is not designated. This is the meaning of Quality Standard No. 3 "Impact of Nondesignation on Wilderness Values." The greater the difference between benefits and resource values foregone in the "with" case as compared to the "without" case, the stronger will be the case for the recommendation of the study.

Analysts and managers should recognize that the time, effort and level of sophistication of the analyses should reflect the magnitude of the resources at stake and the intensity of the resource conflicts. Analysts and managers are expected to be able to judge the importance of the wilderness values and/or the commodity values at issue from their knowledge of the areas and their evaluation of public comments and to develop studies to a level of detail, accuracy, and completeness that is in accord with the importance of the issues. Some of the estimation techniques presented in this paper which deal with recreation values, mineral values, and local economic impacts can require substantial inputs of data, skilled analytics and computer time. The resources available to BLM and the time available for studies do not always permit the use of the more demanding techniques. Also, the benefits of the more difficult techniques do not always justify their costliness when compared to the results of a careful interpretation of the best data that can reasonably be collected and presented to conform to the Wilderness Study Policy. Additionally, it is important that the analyst present managers with the limitations of any estimation. That is, rather than present national values from another study as an unqualified estimate, indicate the origins of the estimate and treat it as a general rather than a specific indicator of value. This is particularly relevant when discussing unit day value (UDV) estimates or assumptions based on similar site use or valuations. These types of data linkages and assumptions should be clearly addressed.

The estimation techniques presented in this paper do not cover all of the resource values which may need to be addressed in a wilderness study. The values addressed here are: wilderness recreation, wildlife recreation, other recreation, livestock/grazing, timber, minerals, and local impacts. These were chosen because:

1. field personnel request such guidance, particularly on noncommodity values;
2. these subjects represent what may be the most frequently occurring resource conflicts; and
3. these activities are most likely to affect local economies.

The user is reminded that other resource considerations in the area should also be examined in the study process. As emphasized in Criterion No. 1 of the Wilderness Study Policy, these are ecological, scenic, scientific, educational, conservation and historical use. This paper does not imply that greater emphasis should be placed on the values discussed herein than on other considerations.

The document is presented in five major sections:

Introduction
Discussion of Concepts
Techniques for Estimating Resource Values
Techniques for Estimating Economic Impacts
Appendices

In addition to having read the Wilderness Study Policy of February 3, 1982, the user is advised to read the "Discussion of Concepts" before reviewing the techniques presented. This discussion should provide an understanding of the purpose of estimating resource values as compared to measuring economic impacts. It also discusses how to treat uncertainty in resource economic evaluations through the use of sensitivity analysis.

Before selecting a technique, the user should be familiar with the characteristics of the area under study. In particular, it is necessary for the user to be aware of:

1. Managerial concerns
2. Identified issues

3. Resources present
4. Degree of resource conflicts
5. Available time, staff and funds

The user should then examine the techniques presented to determine which meet the analytic needs (The user is advised that this paper does not include all the procedures for conducting a complete cost-benefit analysis). Consultation with the State Office economist for assistance in selecting the most appropriate technique(s) is recommended.

II. DISCUSSION OF CONCEPTS

A. Concepts

1. Introduction

Economic analysis serves two functions in resource planning. This report discusses these functions in the context of wilderness studies.

First, economics provides a framework for estimating the effects of wilderness designation or nondesignation in terms of expected gains or benefits and the cost of obtaining these benefits. An economic assessment of the gains and losses (and to whom they acrue) helps clarify the efficiency and equity issues in decision problems. Both resource values that are measured in dollars and those that are not must be displayed and documented.

Second, economics provides a measuring stick to make any of the physical resource values comparable if they can be measured in dollars. Since each wilderness study area (WSA) can provide many alternative market and nonmarket resources, a decision as to which combination of resource uses will provide the greatest benefit to public land users and the nation requires a comparison of these possible resource values. By estimating the economic value of these resources, the range for speculation and judgement can be reduced (but not eliminated). The more of the resource outputs for designation and nondesignation that can be valued with accuracy and precision in equivalent terms (dollars), the more the decisionmaker's range for subjective judgement will be reduced. While economic analysis will not provide the complete answer, it will sharpen the issues which the decisionmaker must weigh in the balance.

The economic analysis techniques provided in this report divided into two categories: (1) Estimating Resource Values, and (2) Estimating Impacts on Local Economies.

The techniques for analyzing Resource Values measure the economic gains (or losses) to resource users of having (or not having) the opportunity to utilize a particular natural resource. This is commonly defined as user's willingness to pay to have that resource. The willingness to pay concept is a standard valuation criterion in economic decisionmaking. (U.S. Water Resources Council, 1979; Mishan, 1976; Dwyer, Kelly and Bowes, 1977; Walsh, Gillman and Loomis, 1981; Freeman, 1979). Willingness to pay values can be estimated from the demand curve for use of a resource. To say a resource (such as animal unit months (AUM's) or a recreation visitor day) has an economic value of $5.00 means that the average willingness to pay is $5.00 per unit consumed.

The techniques presented here cover the valuation of both marketed and nonmarketed commodities. The distinction is important. Marketed commodities like timber and grazing have prices placed on them by competitive markets in which they are bought and sold. Nonmarketed commodities like backpacking, fishing, or hunting are not usually priced by being bought and sold in competitive markets. In order to estimate the economic values of nonmarketed commodities it is necessary to simulate the market for them. The techniques presented here simulate the market and estimate demand and value from the simulation.

Costs are most conveniently thought of as the value of the goods foregone by a decision. The opportunities foregone, or the opportunity costs, of a resource management decision are the values of the goods that would have been produced without the decision and will not be produced with the decision. The with and without concept is crucial to thinking clearly about both costs and benefits.

These techniques provide the resource value information needed to conduct an "efficiency analysis" of alternatives. The efficiency effects of a resource management action are equivalent to the net benefits of the action. In an efficiency analysis benefits and costs are defined in terms of the national income accounts. (The Water Resources Council Principles and Standards refer to this as the NED account). An action is efficient if the benefits exceed the costs. National income is increased by the equivalent of the net benefits of an action. Conversely, benefits are less than costs in the case of an inefficient action and national income is lessened.

Measuring the impacts of alternatives on local-county or multi-county-economies is another important aspect of the wilderness study process. Proper determination of the effects on local economies requires attention to and display of the likely effects over time. This measurement sometimes involves use of employment and income multipliers (or input-output models) to indicate the changes in direct and indirect employment or income. Although extremely important to the local economies, these impacts are distinctly different from the efficiency effects of an alternative. That is, if an activity is precluded from one locale, there may be more of that activity somewhere else (albeit of slightly lower quality and/or higher cost) and these secondary impacts will be registered in the second locale; not in the first. The difference is that the impacts are transferred from one locale to another. 1/

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[1] Only if the factors of production (labor, machinery, and other natural resources) have no alternative economic use (that is, these factors will be unused for the entire length of the resource action) will the change in gross income be equal to the value of the resources.

Generally, the local economic effects of an action pass through three stages. The immediate or short run effects of designation and nondesignation are the effects often reflected in standard input-output models. In the transition period where the economy has time to begin to adjust to the new action, the rate of displacement or hiring and the counterbalancing forces of replacement activities begin to be felt. In the longer run, the adjustment is complete with a stable workforce that now produces a different mix of products than before the action. At this time, only the Forest Service IMPLAN model has a re-employment analysis option that looks at this transition. Thus, the analyst and decisionmaker should be aware that the short run changes may often exceed the long run changes.

Although efficiency effects and changes in local economic activity both may be stated in dollar terms, these dollars are measuring conceptually quite different effects. The analyst should use the resource value techniques for comparing benefits or costs of designation or nondesignation under Criterion 1 and Quality Standards 2 and 3 of the Wilderness Study Policy. The techniques for determining the effects on local economies are useful for analysis under Quality Standard 5 (Local Social and Economic Impacts).

2. Selecting a Tool and the With-Without Approach

The analyst is not expected to utilize all the tools presented in this document. The analyst should initially determine which resources are likely to be significantly affected "with" designation and "with-out" designation. Resource values which are not affected by the decision in terms of quantity or quality do not need to be addressed with extensive economic analysis.

If it is determined that a specific resource value will be affected or some sector of the local economy will be changed significantly by designation or nondesignation, then selecting the specific analytic tool may be necessary. To make such a selection, several factors must be considered. First, one must determine how critical the change in resource value is to the recommendation of whether or not to designate. If it is critical, one of the more advanced empirical techniques may be preferable. If it is not, then a less rigorous method may be more appropriate. Second, in selecting a tool consider the time frame to complete the study, staff availability and funding.

Ideally, these factors should be commensurate with the complexity of the issues to be analyzed. When weighing these factors, however, it may be better to rely on basic data without attempting to develop dollar values which are not arbitrary, than to gamble on successfully completing a sophisticated analysis in a short time period.

3. Analyzing and Portraying Uncertainly in Resource Values

One of the advantages of quantification is that a range of numbers representing low, most likely and high estimates of values can be presented to the decisionmaker. Thus, if the low estimate of benefits exceeds the high estimate of costs, then the decisionmaker can be relatively certain that the effects of his or her recommendation will be as intended. When using statistical tools, ranges or confidence intervals can be placed around estimates of resource values.

The technique of generating a range of likely estimates for any variable when different assumptions are used in the analysis (holding all other variables constant) is a practice often called "Sensitivity Analysis." Sensitivity analysis illustrates the extent to which findings vary when underlying assumptions regarding the current or future estimate of some variable are altered (e.g., what if any, change will be in the findings of the analysis if I assume a different population growth rate?)

To the greatest extent possible, the analyst should present their findings to the decisionmaker in a manner which reflects the level of uncertainty in the analysis.

B. Specific Comments on the Methods for Estimating Resource Values

The following outline highlights specific considerations and key issues for evaluating the techniques described in Section III, Techniques for Estimating Resource Values. Additionally, comments are made under number 6 on estimating preservation values. The analyst and manager are urged to review this outline and carefully consider these points before opting to utilize any of the techniques presented.

1. Estimating Recreation Use

a. Extrapolation from other Areas.

1. Can areas be found that are closely comparable to the area under study? Remember that comparability includes not only recreational characteristics but being equally accessible to comparable population.

2. Be aware that any projection of trends is fallible but that projection is critical only if wilderness uses are growing at a different rate than nonwilderness uses. Make sure there is a case for such differential growth rates before investing heavily in projections.

b. Jungst Wilderness Use Equation

Consider the disadvantages carefully before deciding to use the Jungst equation. It can quite easily be a waste of time and its results no substitute for developing your own primary data base.

c. Trend Line or Time Series Regression Analysis

Before developing a mathematical trend line, inspect a graph of the data and look for anomalies. If the data has to be "forced" into a linear trend, then proceed with caution, if you are to proceed at all.

d. Similar Site Travel Cost Method for Use Estimation and Site Specific Travel Cost Method for Use Estimation

There are many hurdles to pass in adapting the travel cost method from a similar site or in developing a site specific travel cost model. The dominant problem is that one had better be prepared to develop a multivariate model applicable to a system of substitute wilderness areas in order to effectively use the travel cost method. This is essentially a research undertaking and would best be done at a state or multistate level in collaboration with some university researchers. If the individual area study team cannot find a good quality travel cost study that is applicable to their area, it is doubtful if they should attempt their own study.

2. Estimating Recreation Dollar Benefits

The tradeoff the analyst faces in estimating recreation dollar benefits is easily stated. The simpler and easier the method used, the more it relies upon judgment and the more the results must be defended against the charge of arbitrariness. The more analytic the method, the less it may rely upon arbitrary judgment but the more complicated and difficult it becomes to execute successfully.

The judgment methods presented here are:

a. Extrapolation from other areas or studies;
b. Resources Planning Act values;
c. Unit day value method;
d. Similar site travel cost method.

The analytic methods are:

a. The site specific travel cost method;
b. The contingent value method.

The best approach to estimating recreation dollar values in wilderness studies might be to quantify the commodity values in a with and without comparison and to do the same for the recreation use days. Then divide:

$$\frac{\text{changes in commodity values}}{\text{change in use days}}$$

To get a rough opportunity cost in dollars per user day reflecting the commodity values sacrificed in exchange for an increase in recreation use. Now it is a matter of judgment whether the opportunity costs of wilderness designation are high or low. (Of course, the judgment must be tempered by differences in the kinds of user days, uniqueness of the wilderness preserved, off site values and local impacts.)

If the commodity values at issue are large and/or local impacts are large and the judgment call is not easy, then some further analysis of recreation dollar values (and commodity values) may be indicated. In this case analytic methods may be called for.

3. Estimating Grazing and Livestock Values

While it is true that the prices of AUM's can be derived from markets, it will always be a problem to find situations comparable to the one being evaluated. Since BLM forage may differ from private forage in season and other respects, it will seldom be possible to find an exact match. Therefore, the steps taken to adjust the referrent values to the BLM forage should be explicitly described. It is also expected that the with and without comparison will take account of the differences in resource management costs to be experienced both by BLM and the permittee. In some cases these savings from a lower level of management may be significant.

4. Estimating Timber Values

The prices used for calculating timber values are generated by markets and estimating the values of projected timber sales is standard forest economics. However, BLM timber harvests involve costs to the BLM which should be netted from the gross value of the timber sale in the without case and counted as a saving in the with case.

5. Estimating Mineral Values

The principal problem in estimating mineral values stems from uncertainly. Deposits may have a physical presence or they may have an inferred presence based on geological evidence. An economic presence or the lack of one will be based on projected future conditions which may change. Any statements about mineral values will be based on assumptions which should be clearly stated and on uncertainty which can be handled by showing conclusions as a range of outcomes.

6. Estimating Preservation Values

The basic indicators of preservation values in a wilderness study area are found in the physical analysis of the land forms and vegetation types and other evidence of ecologic, scenic, zoologic, scientific, historic, or cultural uniqueness. The degree to which uniqueness is present is a matter of judging the evidence and not a matter of precise mathematics. At this time, research has resulted in some equations for estimating preservation values which may yield interesting results, but are no substitute for the basic description of wilderness characteristics that must be presented.

To clarify how non-market values should be addressed in EIS's and studies, the analyst is referred to existing mandates in the National Environmental Policy Act (NEPA) of 1969. Section 102(2)(B) states:

> "The Congress authorizes and directs that, to the fullest extent possible: ... all agencies of the Federal Government shall - Identify and develop methods and procedures, in consultation with the Council on Environmental Quality established by title II of this Act, which will insure that presently unquantified environmental amenities and values may be given appropriate consideration in decisionmaking along with economic and technical considerations."

Additionally, the Council on Environmental Quality regulations (40 CFR Parts 1500-1508) state in section 1502.23:

> "To assess the adequacy of compliance with section 102(2)(B) of the Act the statement shall, when a cost-benefit analysis is prepared, discuss the relationship between that analysis and any analyses of unquantified environmental impacts, values, and amenities. For purposes of complying with the Act, the weighing of the merits and drawbacks of various alternatives need not be displayed in a monetary cost-benefit analysis and should not be when there are important qualitative considerations. In any event, an environmental impact statement should at least indicate those considerations including factors not related to environmental quality, which are likely to be relevant and important to a decision."

C. Evaluating Local Income and Employment Effects

The output of an industry is needed as input into other industries or even itself in some cases. Output from a given industry is dependent on its input requirements from various industries. Our economy contains an interindustry dependency that has been modeled. Technical input-output relationships have been hypothesized to exist. Loomis and Walsh have identified three analytical techniques that utilize this interindustry dependency and can be used to estimate secondary income and employment impacts. They include:

1. Bureau of Economic Analysis - Water Resource Council: Regional Multipliers
2. Forest Service: Economic Impact Analysis System (IMPLAN)
3. Colorado State University: Input-Output Model and Multipliers

BLM personnel should be aware that other techniques for estimating regional impacts are available. As part of the "Reference Guide to Social and Economic Techniques" issued by the Bureau of Land Management's Office of Planning and Environmental Coordination in March 1982, the following regional impact models have been described:

1. Bureau of Land Management: Regional Input/Output Model
2. Montana State Office: Economic/Demographic Computer Model
3. Forest Service: Economic Impact Analysis System (IMPLAN)
4. Forest Service: Socio-Economic Impact System (SIS)
5. Bureau of Reclamation: Economic Assessment Model (BREAM)
6. Utah State Office: Utah Process Economic and Demographic Impact Model (UPED)
7. Department of Energy: Social and Economic Assessment Model (SEAM)
8. University of Maryland: Multi-regional, Multi-Industry (MRMI) Forecasting Model
9. University of Minnesota: Fiscal Impacts Model

Only the Forest Service IMPLAN model has been duplicated by Loomis and Walsh. In using an input-output approach, the user should be aware of several limitations. Final demands for good and services are determined outside the model. It would be preferable for demands of goods and services in the region to be determined directly in response to the development being examined and the induced changes in the region's economy.

In addition, within an input-output model, technical coefficients describing the industrial relationships in a region may be outdated. This may not be a problem in areas where the structure of an economy does not change over time. However, in some applications, major new industries are being introduced into a region's economy (for example, mineral development) and new secondary development may be expected to occur. Technical relationships described by an input-output model may no longer be applicable.

Another limitation of the input-output approach would exist if the areas being studied does not conform to the area for which the technical coefficients have been developed. The applicability of a model's relationship to a given area being studied may not be easy to determine. The severity of the problem depends on the area being studied and the interindustry dependencies described in the model.

If it is important to predict how the economy of a region may behave over time, an input-output approach may not be suitable. The techniques described by Loomis and Walsh will not allow an examination of the adjustment process that results from the introduction of major development into a regional economy. It becomes obvious from the preceding discussion that additional technical expertise may be needed before the techniques described are applied.

III. TECHNIQUES FOR ESTIMATING RESOURCE VALUES

A. Estimating Resource Use

Evaluation of an area for suitability or nonsuitability as wilderness often involves an analysis of types of recreation opportunities that will be possible or would continue with and without designation. For example, designation would provide opportunities for backpacking in an undeveloped setting while off-road vehicle use will be displaced. For recreation opportunities gained and lost the analyst should know the magnitude of the recreation use lost and the dollar benefits associated with that use.

The primary recreation opportunities described in this section relate to wilderness type recreation (see Wilderness Inventory Handbook, pg. 13 for a list of the typical wilderness activities), general dispersed recreation (motorized and nonmotorized) and wildlife dependent recreation. This does not include analysis of other types or using other recreation classification schemes. First, a general technique for use estimation applicable to some (if not all) of the recreation activities will be presented. Then, more specific use estimating techniques will be suggested for particular types of recreation activities. The advantages, disadvantages, and data sources will be provided for each technique.

Note: Visitor Days as a Unit of Measure: The unit of measure for recreation use most often encountered is Visitor Days. A visitor day can represent a visit (or combination of visits) equalling 8 or 12 hours. In this report a Visitor Day will mean a 12-hour day. This makes it equivalent to the U.S. Forest Service Recreation Visitor Day (RVD). Using Visitor Days or RVD's, an overnight camping trip equals 3 visitor days or RVD's. Note, to obtain Visitor Hours, simply divide each RVD or Visitor Day by 12.

1. CURRENT AND FUTURE USE ESTIMATES BY EXTRAPOLATION FROM OTHER AREAS OR STUDIES

General: To utilize some of the techniques that follow, an estimate of current or initial recreation use is required. While many of the empirical techniques provided in this document do this, they often require time or data beyond that available to the analyst. Therefore, this approach is offered as a means to quickly and simply provide a rough estimate of current recreation use.

By looking at existing recreation areas and their use levels, an estimate of current visitor days per acre can be calculated. This visitor days per acre factor then can be multiplied by the acreage under study to estimate the current use in that area. If possible, visitor days should be classified by activity.

Several studies also have estimated trends in visitor days by activity or for a specific recreation site. These trends can be applied to estimates of current visitor days to obtain an approximation of future use. This technique can be applied to wilderness recreation, general dispersed recreation, and wildlife recreation.

To apply this simple forecasting approach the analyst applies trends in either activities or areas to the activity or area under study. The analyst should try to match the areas with trends to the area under study as closely as possible by taking into account recreation resource characteristics, market area population, location and degree/type of access.

Advantages: When carefully used, this method can provide an approximation of current and future use. The key advantage of this method is the ease of application. Few staff hours or data are required to utilize this technique. The extrapolation approach is best suited for WSA's with few conflicts or in which recreation is of minor importance in determining suitability or nonsuitability for wilderness.

Disadvantages: The technique requires a great deal of professional judgment. The rationale used by the analyst to match trends and areas should be documented. Although in some cases this technique could be made site specific, in most cases the application will not provide a uniquely site specific forecast of future recreation use.

Data requirements: There are two primary data requirements. The analyst must find acreage and visitor days of existing recreation areas which are similar to the area under study for that activity. Secondly, the analyst must find and select recreation use trends that match the activity and area under study.

Data sources: The following references provide data sources for recreation use trends for wilderness and dispersed recreation.

1. Estimates of Wilderness Recreation Use

Extensive data and literature are available on recreation use. Recreation in general has been increasing over the past two decades. Following is a list of selected studies and data sources for possible use in wilderness studies.

The U.S. Forest Service reports use statistics by wilderness areas yearly and thus one source of data on use per acre and trends in use are these reports. They can be obtained from each Regional Office of the Forest Service.

Hendee, Stankey and Lucas (1978) have use rates and visitor days per acre for each wilderness and primitive area in 1975. Walsh, Loomis and Gillman (1981) have a recent listing for Colorado.

Data for BLM's Instant Study areas such as Grand Gulch, Paria Canyon, Aravaipa, etc., can provide visitor days per acre as well as use trends for the last 5-10 years.

Hendee, Stankey and Lucas (1978) also present general growth rates in wilderness recreation use. This is very useful reference for recreation use as well as other aspects of wilderness evaluation.

Jungst (1978) states that use has risen at a 9.5 percent annual rate over the last thirty years. His cross sectional time series model conservatively predicts a 2 percent increase in use per year to the year 2020. However, his lagged time-series cross section model forecasts a 5.6 percent increase. This model will be discussed further in the next section.

Many Forest Service areas and National Park Service areas maintain records from which data for similar sites could be extrapolated. The National Park Service, Denver Service Center (Statistical Unit), Denver, Colorado, can provide such information as can Forest Service Regional Offices.

2. Estimates of General Dispersed Recreation Use
   (a) Old BLM Resource Area files often contain visitor registers or staff reports which would be useful in making use estimates and trend analyses.

   (b) Hof and Kaiser (1981) provide background data as follows: Regional dispersed recreation use trends (percentage increase over 1977) are provided for off-road vehicle (ORV) and snowmobiling since these activities would be foreclosed by wilderness designation. Use trends for General Dispersed Recreation also are provided as displayed below:

Rocky Mountain Census Region
Cumulative Percentage Increase since 1977

Year	General Dispersed Recreation	ORV Use	Snowmobiling
1980	3%	2%	6%
1990	23%	23%	33%
2000	41%	46%	68%

Pacific Northwest Census Region (Oregon & Washington)
Cumulative Percentage Increase Since 1977

Year	General Dispersed Recreation	ORV Use	Snowmobiling
1980	4%	8%	5%
1990	19%	34%	23%
2000	46%	77%	49%

California
Cumulative Percentage Increase Since 1977

Year	General Dispersed Recreation	ORV Use	Snowmobiling
1980	1%	1%	3%
1990	13%	13%	17%
2000	31%	31%	33%

The data for the use projections came from the 1977 National Recreation Survey and were projected based on 1980 Office of Business Economic Research Service (OBERS) Projections (Personal Communication with Dr. John Hof). The methodology for the use estimates is presented in Hof and Kaiser (1981).

An example of how the factors might be used is as follows:

Region is Rocky Mountain. The ORV base use in 1977 was derived from visitor use estimates made by the recreation planner. The base use is 1,000 visitor days. Use in 1990 would then be estimated as 1,230 visitor days (0.23 x 1,000 + 1,000).

Adams et al. (1973), in a U.S. Department of Interior report entitled "Outdoor Recreation: Appendix A: An Economic Analysis", provided some estimating equations and participation equations by census region that may be of help. These data are quite old and very broad in geographic coverage so it will at best provide an approximation of future use.

2. JUNGST WILDERNESS RECREATION USE EQUATION

General: The Jungst use equation is a time-series cross section regression equation which predicts wilderness use on the basis of four variables: Wilderness acreage, population, income and education. It was developed by Steven Jungst for the U.S. Forest Service to support the 1980 RPA effort. The model is based on 80 observations drawn from 1965-1975 use data in the eight Forest Service regions. The interested reader is referred to Jungst (1978).

Advantages: The equation is useful when data do not exist on current or potential use of the WSA under study. In this case, the method provides a documented technique for estimating potential current and future use as a result of designation and projecting future use of the WSA.

The equation is particularly suitable when the WSA under study is near Forest Service roadless, primitive or wilderness areas or is similar in its wilderness recreation characteristics to Forest Service areas.

One use of the equation is as a "benchmark" to evaluate estimates arrived at by using professional judgment or extrapolation.

Disadvantages: The prime weakness is that the equations were developed using only the relationships among the variables from Forest Service wilderness areas. Thus, when the WSA under study is quite different in its wilderness recreation characteristics or geographic location as compared to Forest Service areas in the Region, the equation may not give a meaningful estimate. In these cases, the estimate at best could serve as a "benchmark" or one end of a range of recreation use estimates. Another weakness is that the the equation's use estimates may not fully reflect the influence of substitute wilderness areas in a statistically desirable manner. The equation treats an acre of wilderness the same in projecting use regardless of its location to population centers or its wilderness characteristics.

Also, the equation, while useful in predicting wilderness recreation, does not of course provide information and data on recreation opportunities lost as a result of wilderness designation. Thus, the analyst still must determine the net gain or loss by evaluating other recreation opportunities foregone, i.e., application of the with and without criteria.

This brings us to its last weakness, that of underestimation of future use. If the WSA is located near population centers, the Jungst equation may grossly underpredict use now and in the future. As noted previously, the equation to be presented here projects future use increases as just 2 percent a year, while past trends are about 9-10 percent a year. Also, the equation estimates Recreation Visitor Days per acre ranging from .14 to .38 in the western United States. This is below the national average of .49 (Hendee, Stankey and Lucas, 1978).

Data Requirements: All that is needed to utilize the Jungst equation is the equation itself, acres of the study area, wilderness acreage in the Forest Service Region in which the area under study is located, income, education and Forest Service Region population estimates. All of these but the study area acreage are provided in the following table.

The Jungst equation is:

$$LWU + INT + .8364(LWA) + .4586\ (LPOP) + 1.3072(LMFI) + 5.4156(LMME)$$ where

$LWU = \text{Log}_{10}$ of wilderness use in Recreation Visitor Days (RVD's)

INT = Adjusted regional intercept

$LWA = \text{Log}_{10}$ regional wilderness acreage

$LPOP = \text{Log}_{10}$ regional population

$LMFI = \text{Log}_{10}$ regional median family income

$LMME = \text{Log}_{10}$ national median male education

The intercepts are as follows:

Region 1 (Montana, North Dakota and Northern Idaho)	-14.0009
Region 2 (Colorado, Wyoming, South Dakota)	-13.9363
Region 3 (Arizona and New Mexico)	-14.0575
Region 4 (Nevada, Utah, Southern Idaho)	-13.8308
Region 5 (California)	-13.5871
Region 6 (Oregon, Washington)	-18.8313

The regional values of LWA, LMME, LMFI and LPOP for each Forest Service Region are as follows:

Table 1a. Values of Independent Variables for Projection Years for Use in Jungst Equation.

	1980	1985	1990	2000	2010	2020
Region 1						
Acreage	3,646,948	- - - - - - - - - -same	- - - - - - - - - -	- - - - - - - - - -	- - - - - - - - - -	- - - - - - - - - -
Population	1,720,000	1,754,000	1,789,000	1,895,000	2,042,000	2,209,000
Family Income (1975 $)	14,744	15,171	15,599	16,455	17,310	18,165
Education	12.5	12.6	12.7	12.9	13.1	13.3
Region 2						
Acreage	2,365,897	- - - - - - - - - -same	- - - - - - - - - -	- - - - - - - - - -	- - - - - - - - - -	- - - - - - - - - -
Population	7,591,000	8,036,000	8,481,000	9,466,000	10,670,000	12,030,000
Family Income (1975 $)	14,744	15,171	15,599	16,455	17,310	18,165
Education	12.5	12.6	12.7	12.9	13.1	13.3
Region 3						
Acreage	1,657,796	- - - - - - - - - - same	- - - - - - - - - -	- - - - - - - - - -	- - - - - - - - - -	- - - - - - - - - -
Population	3,800,000	3,623,000	3,446,000	4,399,000	4,956,000	5,536,000
Family Income (1975 $)	14,744	15,171	15,599	16,455	17,310	18,165
Education	12.5	12.6	12.7	12.9	13.1	13.3

Table 1b. Values of Independent Variables for Projection Years for Use in Jungst Equation.

	1980	1985	1990	2000	2010	2020
			Region 4			
Acreage	2,058,969	- - - - - - - - - -	-same - - - - - - - -	- - - - - - - - -	- - - - - - - - -	- - - - - - - - -
Population	2,269,000	2,492,000	2,715,000	3,172,000	3,732,000	4,381,000
Family Income (1975 $)	14,744	15,171	15,599	16,455	17,310	18,165
Education	12.5	12.6	12.7	12.9	13.1	13.3
			Region 5			
Acreage	2,055,164	- - - - - - - - - -	-same - - - - - - - -	- - - - - - - - -	- - - - - - - - -	- - - - - - - - -
Population	24,166,000	26,704,000	29,241,000	34,298,000	40,174,000	46,829,000
Family Income (1975 $)	14,744	15,171	15,599	16,455	17,310	18,165
Education	12.5	12.6	12.7	12.9	13.1	13.3
			Region 6			
Acreage	1,923,972	- - - - - - - - - -	- same - - - - - - - -	- - - - - - - - -	- - - - - - - - -	- - - - - - - - -
Population	6,350,000	6,831,000	7,311,000	8,278,000	9,395,000	10,635,000
Family Income (1975 $)	14,744	15,171	15,599	16,455	17,310	18,165
Education	12.5	12.6	12.7	12.9	13.1	13.3

The equation estimates the common log of Recreation Visitor Days (LWU). To get Recreation Visitor Days (RVD's), you need to take the anti log (to the base 10 of LWU) to convert your answer to RVD's.

In estimating use days with the equation, set the LWA or regional wilderness acreage at the amount in the table and make a base run. This is RVD's without any additional WSA's. Then add the acreage of the WSA and rerun the equation. The difference in RVD's is what is attributable to the WSA under study.

If you are going to use this equation for a large number of WSA's at one time, you might want to consider programming the equation in to a programmable calculator to save time. A calculator program applicable to a TI-58 or TI-59 is presented in Appendix 2.

Contact John Loomis, U.S. Fish and Wildlife Service, Fort Collins, Colorado, if you have any questions on the specific of application of this technique.

3. TREND LINE OR TIME SERIES REGRESSION ANALYSIS

General: Future changes in recreation use by activity can be estimated by extrapolating previous years use data with a pocket calculator. Many universities and State Game Departments have both published and unpublished use statistics for the last 10-20 years which can be processed to develop use projections. Single variable trend line or linear (and nonlinear) regression can be performed on most advanced pocket calculators (TI-55, TI-58, TI-59, SR-II, etc.)

Advantages: Since in many states the available wildlife and recreation data are site specific, management unit specific or county specific, use increases can be forecast on a very localized basis. By moving from single variable regression to multiple regression, the analyst can try other explanatory variables (such as success rate, income, education, etc.) in hopes of a statistically significant multiple regression to forecase future use more precisely. Since it is a statistical technique, confidence intervals can be place around estimates.

Disadvantages: The primary weakness is in the technique and in data limitations. Specifically, if one has only a short time span covered by the data (5 years or less) then statistical error by extrapolation is high. Time series methodology has limitations regarding functional forms, the distribution of data and properties of statistical estimators.

Data Requirements: The primary data requirement is the number of visitor days over the last 10-20 years for each county, management unit or site. If the analyst has the number of recreationists, this can be converted to visitor days using an average length of stay factor.

Data Sources: State Fish and Game Department harvest books and unpublished data in their State Headquarters often will provide the needed data for wildlife species. The U.S. Forest Service provides wilderness use data by year for each wilderness area. These can be obtained from the respective Regional Office of the Forest Service. Many State universities and State Outdoor Recreation Departments also have unpublished data useful for time series regression.

An example of the simplified time-series technique is provided below:

DEMAND DATA FOR SAMPLE HERD UNIT
Historical Use Trend in Hunter Days for the Study Area

1970	1971	1972	1973	1974	1975	1976	1977	1978	1979
200	220	215	230	150	260	270	265	270	275
1	2	3	4	5	6	7	8	9	10

Using a pocket calculator with a trend line or regression analysis option, the relationship between time and use days was estimated. This relationship then was projected into the future with the assumption that there would be no significant changes in this relationship. If this assumption is not likely to be met, then a multiple variable regression should be used. Forecasting with multiple regression requires only that the individual coefficients not change over time.

The equation was:

Hunter Days = 198.66 + 8.515 Time (in years)
R2 = .91

Projected Future Use

1985	1990	2000
355	377	462

4. SIMILAR SITE TRAVEL COST METHOD FOR USE ESTIMATION

General: One of the first Federal Government applications of the similar site Travel Cost Method (TCM) was a use estimating model for Corps of Engineers Reservoirs (Brown, Crane, Des Jardin and Hydra, 1969). In 1979, the Travel Cost Method became a standard approach for both use estimation and benefit estimation for actions which significantly affect recreation (U.S. Water Resources Council, 1979). The similar site TCM can be applied to estimate both current and future recreation use with and without designation. It can be used for wilderness, wildlife, and dispersed recreation activities.

The simple Travel Cost Method estimates trips per capita of a given population to a recreation area as a function of the travel cost to the area from the recreationists' residence. A simple TCM equation is of the form

$$\text{Trips per capita} = a + b \text{ Travel Cost}$$

Travel costs include the out of pocket cost per mile plus an allowance for the value of travel time. The value of travel time represents the cost to individuals due to the travel time being taken away from other activities.

With an existing TCM equation for a WSA similar to the WSA under study, it is possible to estimate use and dollar value of the recreation benefits of the WSA under study. A use estimate can be developed by matching up WSA's with others that either have data so a TCM equation can be estimated or to WSA's that already have a TCM equation. The use estimate will take into account the WSA's wilderness recreation characteristics and its spatial location from population centers. In addition, future use can also be estimated due to changes in populations.

Advantages: The advantage of a similar site TCM equation is that, even with the same TCM equation, recreation use estimates will now vary among WSA's in relation to the WSA's location relative to population centers. In this sense, the TCM approach is better than many other methods.

If the recreation characteristics of the WSA under study match that of the areas with the TCM, the estimated use should be relatively good. It is important that the sites being matched are of similar size. If not, the final use estimates must be "scaled" by the ratio of the acreages of the two areas.

The TCM equations that provide use estimates are useful for predicting management needs and access requirements.

One of the advantages of using a similar site travel cost method equation is that the overall Travel Cost Method is a conceptually sound approach consistent with consumer demand theory. In fact, TCM is no more than a cross sectional demand study using Travel Costs as the price. Thus, use and benefits estimated using this method will be comparable to other market and nonmarket resources. Lastly, once use is estimated with a TCM equation, recreation benefits can be easily calculated.

Disadvantages: The primary weakness of a similar site TCM (as opposed to the TCM itself) is the subjectivity of matching up areas with a TCM equation to the area under study. Other weaknesses include lack of enough existing TCM equations and the degree of statistical reliability of the existing equations. The assumptions of the Travel Cost Method itself can be found in Dwyer, Kelly and Bowes (1977).

Data Requirements: There are two categories of data necessary to utilize a similar site travel cost method. First is an existing TCM equation or the visitor origin-destination data to build a TCM equation. It is worth emphasizing that the TCM equation must be a traditional or zonal TCM equation rather than an "individual observation" type (see Brown and Nawas, 1973).

The other category of data is the set of likely visitor origins for the WSA under study. That is, what counties, Standard Metropolitan Statistical Areas (SMSA's), and States are people likely to come from. Once these are determined, the population of each origin and round trip distance from that origin to the site under study are obtained or estimated. These often can be found in a current U.S. Atlas. Note, by dividing the travel cost coefficient into the intercept, the resulting number will reflect the maximum round trip travel costs. Possible visitor origins with round trip travel costs greater than this can be ignored.

The distance is converted to "Travel Cost" by multiplying the round trip distance by the variable cost per mile (in 1979 it was 12.6 cents, see latest U.S. Department of Transportation Cost of Owning and Operating a Motor Vehicle). The value of travel time also must be estimated. The U.S. Water Resources Council indicates that 1/2-1/3 the adult wage rate is a useful approximation of the value of travel time per hour. The sum of value of travel time per mile and transportation cost per mile gives the Total Travel Cost per mile. (Previous TCM studies have used estimates of Total Travel Cost per mile ranging from 17-20 cents a mile.)

Data Sources: Data sources are quite specific to the resource (wilderness, wildlife and general recreation) under study. Thus, data sources will be given by resource.

Wildlife Recreation:

Similar site TCM equations using the zonal TCM approach in Oregon can be obtained from the Brown and Nawas (1973) report. Unpublished zonal TCM equations also might be obtained from Professor William Brown at Oregon State University. Similar site TCM equations using the zonal TCM approach in Utah can be found in Wennegren, Fullerton, and Wrigley (1973).

To find similar site TCM equations in other states, contact the Department of Economics or Department of Agricultural Economics at the nearest State University. Many federal and state agencies have conducted surveys and prepared "unpublished" TCM equations. Analysts should contact regional or field offices of such agencies to locate and obtain any available equations.

General Dispersed Recreation:

We are not aware of useful zonal TCM equations developed for dispersed recreation activities in the West. However, such equations may exist. The local State Universities may have unpublished studies which contain such zonal TCM equations that could be applied in a similar site fashion. Additionally, visitor registers or informal license plate surveys would provide the data necessary to build such a TCM equation. This equation then could be applied to the WSA under study.

Wilderness:

Although several zonal Travel Cost Method equations have been estimated for wilderness or primitive areas, almost all of these are of Forest Service Wilderness Areas. Most of these Forest Service areas are alpine areas. Therefore, the analyst is advised to use caution in applying those to BLM areas.

A zonal Travel Cost Method equation was estimated for the Grand Gulch and Paria Canyon primitive areas in southern Utah. When applying these data for the equations presented, the analyst should assure that the WSA under study is similar to Grand Gulch or Paria Canyon in terms of the wilderness recreation characteristics and those of the characteristics of the contributing population. Both of these areas are canyon type wilderness areas in Utah. Grand Gulch is 24,181 acres and Paria Canyon is 27, 515. Grand Gulch has numerous archeological sites as well.

The equations presented are accurate for use estimation due to their ability to predict actual use in Grand Gulch and Paria Canyon. (Technically, the equations have been estimated using Generalized Least Squares instead of Ordinary Least Squares due to different population levels at each zone of origin. This insures that the zero price quantity predicts use accurately (See Bowes and Loomis, 1980). Information on "T" values is presented in the section covering the use of similar site TCM for benefit estimation since they are of greater relevance for that purpose.

These Grand Gulch (Loomis, 1979b) and Paria Canyon (Loomis, 1980) TCM equations were early efforts to develop benefit estimates for Instant Study Areas. The data used in the models are from 1977.

The independent variable is round trip transportation costs per mile of 9.1 cents and value of travel time of 8.7 cents per mile or total of 17.8 cents a mile per vehicle. In the equation the travel cost (in hundreds of dollars) referred to is the TOTTC variable. The dependent variable was trips per 1,000 population referred to as T/pop. After trips are calculated, trips are converted to visitor days.

The Grand Gulch and Paria Canyon per capita TCM demand equations are:

$$T/pop = .01543 - .00226\ TOTTC\ \text{(Grand Gulch)}$$
$$T/pop = .04889 - .01651\ TOTTC\ \text{(Paria Canyon)}$$

To estimate use from these equations the following steps are taken:

Step 1. Obtain descriptions of Grand Gulch and Paria Canyon and determine if either is similar to the WSA under study. If neither is at all similar in terms of recreation experience produced, then a different method of estimating use is appropriate.

Step 2. Using an atlas, locate the major population center(s) within say 400 miles one way of the WSA under study. Maintain individual county level visitor origins for the first 150 miles in any direction and then group counties together from 150 to 400 miles. Locate the major population center(s) in states from 400-800 miles (one way) from the WSA.

Step 3. Two approaches are possible at this point. One is to combine county populations into concentric zones of 50 mile widths around the WSA. The other is to measure the round trip distance from each county, group of counties, and state, to the WSA and use these as the points of origin.

An example is provided next for WSA U - 060 - 204 in Utah which is similar to Grand Gulch.

Unit of Observation	Population Center	Round* Trip Distance	TOTTC Travel cost* in hundreds of dollars	Unit of * observation's population in 1,000's
San Juan County	Monticello	50	.089	15.0
Grand County	Moab	100	.178	8.0
Carbon County	Price	300	.534	25.0
Salt Lake City SMSA	Salt Lake	600	1.068	758.00
Arizona	Phoenix	500	.89	2,125.00
Colorado	Denver	700	1.246	2,250.00

With the Travel Cost and the population in 1,000 we now are ready to use the TCM equation to estimate use.

An example for Salt Lake City SMSA is given

$$T/pop = .01543 - .00226\ TOTTC$$
$$T/pop = .01543 - .00226\ (1.068)$$
$$T/pop = .013$$
$$Trips = .013\ (758) = 9.8\ Trips$$

Visitor days = 9.8 x 33** RVD's per Trip = 323

This process is repeated for all the zones

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* Note that what is used here is approximate data as an example

** From table supplied by San Juan Resource Area

Note that if close zones have small populations they contribute little use to the WSA. Data for large, distant zones are important to include because these origins provide a large portion of the estimated use.

The data used to construct the Grand Gulch equation indicated two-thirds of the users were from outside Utah. It was possible to go nearly 1,500 miles before single purpose trips to Grand Gulch dropped to zero. If the reader is unfamiliar with the Travel Cost approach he or she is referred to Dwyer, Kelly and Bowes, 1977.

The equation also can be used for forecasting future use. That is, by simply multiplying visits per capita by the origins future population rather than current population, use is estimated for the year of that future population. For example, if Salt Lake City's population was estimated to be 1 million in 1990, use would be 13 trips or 429 visitor days to this WSA from that origin. The process is repeated for all origin zones.

These simple TCM equations provided here do not explicity bring substitutes into account. The availability of substitutes should affect use of an area. However, the two equations presented are for Primitive Areas that are located geographically in an area with many substitutes for these areas. Therefore, existing travel patterns and participation rates implicitly reflect these other substitute areas. Thus, as long as the WSA, where equations are being applied, do not have more than 10 substitute WSA's or substitute wilderness areas within 50 miles of the site (the configuration present for Paria

Canyon and Grand Gulch) the equations should predict use reliably. If there are more than 10 substitute WSA's within 50 miles, the TCM equation may overestimate use. However, if there are fewer than 10 substitute WSA's within 50 miles then the equation may understate recreation use.

Contact John Loomis, U.S. Fish and Wildlife Service, Fort Collins, Colorado if more information is required.

5. SITE SPECIFIC TRAVEL COST METHOD FOR USE ESTIMATION

General: If either sample or total visitor origin data are available from visitor registers, license plate survey, back country permits or an existing survey, a site specific WSA Travel Cost equation could be developed. This would allow not only for use estimation but, in addition, would provide basis for projecting future use and benefits. The TCM is a conceptually sound estimating technique applicable to many types of recreation activities.

Advantages: This is an empirical approach and would produce the most accurate estimates of current and future use. Another advantage is that WSA specific benefits could easily be estimated once the equation is derived. This approach has been approved for use by Federal Agencies (Water Resources Council, 1979). The TCM equation takes account of the WSA location relative to population centers as well as recreation attractiveness of the WSA.

Disadvantages: The two primary weaknesses are obtaining good data and acquiring the knowledge of how to build a Travel Cost per capita demand equation. This latter problem is not insurmountable if the individual has 2-3 weeks to work on estimating the equation since Dwyer, Kelly and Bowes (1977) and Bowes and Loomis (1980) explain many (but unfortunately not all) the details of the estimation process. If a survey is needed to acquire the origin-destination data, then OMB clearance often will be necessary. This clearance requirement can increase significantly the time for performing a site specific TCM.

The travel cost method involves assumptions at both the behavioral level and in the statistical estimation phase. The statistical assumptions are those relevant to regression analyses in general. These can be found in any elementary statistics textbook.

The key behavioral assumptions in building a TCM equation are:

(1) There is sufficient variation in travel distances to the area under study to reflect individual willingness to pay for recreation there.

(2) That the travel is for the sole purpose of obtaining access to the area under study for recreation.

Violation of assumption number one will make the coefficient on Travel Cost insignificant. There is really no way around this assumption. If you do not meet it (and an insignificant travel cost coefficient does not necessarily mean you have violated the assumption) then another use estimating technique is required.

Data Source for Dispersed Recreation:

Visitor registers and use permits serve as useful secondary sources of recreationist origin data. An on site license plate survey can be done in States were license plates are coded by county.

Land grant universities such as Utah State University often collect this type of data as part of an overall recreation survey. They often will disaggregate the finished data by origin of recreationist at the cost of the programmer and computer time. These disaggregated data are amenable to TCM application. In some instances, the Department of Economics or Recreation Resources of land grant universities may have existing survey data that can be utilized in travel cost method analyses.

Contacts: Institute for Outdoor Recreation and Tourism at Utah State University. Department of Economics at University of Arizona, Colorado State University, New Mexico State University, University of New Mexico, University of Wyoming, University of Idaho, and Oregon State University.

Data Sources for Wildlife User Estimates: The TCM approach is well suited from several standpoints for valuing wildlife recreation. In most cases, the TCM behavioral assumptions are met for wildlife recreation activities. Additionally, there are sufficient secondary data available in most western states. These data can be used to calculate benefit and use estimates from TCM without requiring a survey. Thus, in these applications TCM is quite cost effective.

Violation of assumption number 2 can be corrected using a technique presented in Smith and Kopp (1980).

Data Requirements: The TCM requires knowledge of the recreationists origin or point of residence (city, county, or zip code is sufficient). It is by computing the travel cost from the recreationists origin to the recreation area under study that " prices" paid for recreation are estimated. Based on these prices paid and use rates at those prices, a demand curve can be estimated in a fashion similar to that of a market good in a cross sectional demand study. From this demand curve both use estimates and benefits can be estimated for the site under study.

An alternative to having visitor origin data is knowing the travel cost or distance the recreationist traveled to the recreation area and the number of times they visited the area in the last year. This will allow estimation of an individual observation Travel Cost demand curve (Brown and Nawas, 1973).

Knowledge of the availability of substitute recreation sites is also required. Information on party size (number of people in the vehicle), income, education, and number of years experience is desirable but not necessary for using the Travel Cost Method. If congestion at current area exist, the travel cost model should account for this variable.

Most State Fish and Game or Divisions of Wildlife Resources have the type of origin-destination data necessary to use the TCM. While it may not be accessible in published reports, the departments have the data on computer cards or tapes and may be willing to provide the information at no or minimal cost. The State Fish and Game routinely collect these data from their own surveys or from hunter application data. The quality of the data is usually quite good and for some species represents 100 percent of the users rather than just a sample.

Data Resources for Wilderness Use Estimates: At the present time very few origin-destination data are available that are applicable to BLM WSA's. Visitor registers and recreation use permits constitute most of the existing origin-destination data. A license plate survey at popular trail heads (in states where license plates are coded by county) would be another logical source (which does not require OMB clearance).

B. ESTIMATING RECREATION DOLLAR BENEFITS

General: As indicated by Dwyer, Kelley and Bowes (1977) and Clawson and Knetsch (1966), net willingness to pay or the additional amount that recreationists are willing to pay rather than not recreate at this WSA is the correct measure of user benefits. The secondary effects of recreationists expenditure on local business will be discussed under Techniques for Evaluation of Local Income and Employment Effects.

Benefit estimates of different types of recreation activities play a very important role in analyzing the gains and costs associated with using a given tract of land to provide one type of recreation instead of another. Specifically, the final output of a recreation analysis should be the dollar benefits produced by allowing one particular form of recreation rather than another. Whether one land allocation provides more visitor days does not per se indicate it produces more benefits. Twenty visitor days of river running may be much more valuable to the nation than 60 days of sightseeing. Like any other good the economic benefits produced depends on the degree of enjoyment produced and the relative scarcity of that type of recreation.

1. EXTRAPOLATION FROM OTHER AREAS OR STUDIES

General: By utilizing dollar recreation benefits from other areas or studies the analyst can begin to develop an approximation of what the recreation benefits might be of the area under study. Since there are many existing studies of the value of wildlife recreation, dispersed recreation and wilderness recreation, the analyst quickly can estimate the dollar value of different recreation activities in the area. The analyst must match the areas and activities with studies to the WSA under study.

Advantages: The primary advantage is the quickness by which a benefit estimate can be derived. This method requires little staff time or data.

Disadvantages: The major disadvantage is that extrapolation from past studies requires a great deal of professional judgment in matching areas with studies to the area under study. The criterion used in matching areas should be documented.

Data Requirements: The only data requirement is to locate past studies of recreation benefits that are applicable to the recreation activities and area under study. These dollar values then are applied to the recreation use estimates derived using techniques in the previous section.

Data Source: Since the data sources and dollar value estimates are specific to the resource under consideration, the data sources will by grouped by resource.

Wilderness Recreation Benefits

1. Grand Gulch Primitive Area Southern Utah: $8.00 a visitor day. From Travel Cost Method (Loomis, 1979b).

2. Paria Canyon Primitive Area Southern Utah and Norther Arizona: $60 an individual trip. From a Travel Cost Method (Loomis 1980). Depending on the average length of stay this may mean $15-20 a day.

3. Colorado Wilderness Areas: $14 a visitor day. From an individual observation travel cost of Colorado residents to current or potential wilderness on Forest Service, National Park Service, and BLM lands. See Walsh, Gillman and Loomis (1981).

Wildlife Recreation Benefits:

Generally, the data requirements are simply access to a university library and sufficient knowledge of wildlife recreation economics to evaluate the existing wildlife recreation economic study. Journals of interest would include American Journal of Agricultural Economics, Land Economics, Natural Resources Journal, Journal of Environmental Economics and Management and Journal of Leisure Research.

Summarized below are four state-of-the-art studies of wildlife recreation values.

1. Wildlife recreation benefits for big game, small game, waterfowl hunting, and fishing in Arizona were estimated by Martin, Hum, and Smith (1974).

The techniques used 1970 data and the individual observation Travel Cost Method. The state average consumer surplus or net willingness to pay benefits will be provided by activity. If the reader is interested in substate region specific estimates of dollar benefits by activity, they can be found in Martin, Gum, and Smith (1974).

Activity	Net Benefits Per Trip
Deer Hunting	$52.85
Other big game hunting	$57.48
Small game	$23.89
Waterfowl	$ 9.87
General hunting	$ 6.39
Coldwater fishing	$50.13
Warmwater fishing	$45.92

To convert these benefits per trip to benefits per visitor day will require the average number of hunter or fisherman days per trip. This information can be obtained from the Arizona State Fish and Game Commission.

2. Wildlife recreation benefits for deer and elk hunting in Oregon were estiamted by Brown and Nawas (1973). Their study was an individual observation Travel Cost Method study using 1968 data. The state average dollar value was derived from their results as being $42.85 a trip. Once again to convert to a value per visitor day requires information on the average number of visitor days per trip.

3. Wildlife recreation benefits for deer hunting were estimated by herd unit in Utah by Wennergren, Fullerton, and Wrigley (1973). This study used the Travel Cost Method with data collected in 1970. With this study, and information on hunter days in each herd unit (available from the Utah Division of Wildlife Resources), the analyst could calculate the dollar value per hunter day of deer hunting for the herd unit of interest.

4. Estimates of the value of deer hunting in Wyoming were derived by Brookshire and D'Arge (1980). They estimated net willingness to pay using the Contingent Value Method (Water Resources Council 1979). The average value was $37.50 a trip. To convert to value per day, estimates of the average number of days per trip would be needed.

2. RESOURCES PLANNING ACT VALUES

General: The Resources Planning Act (RPA) Values were developed by the U.S. Forest Service for use primarily in the 1980 Resource Planning Act Assessment. They have also been used by the U.S. Forest Service in their Land Management Planning Process. The values for Recreation and Wilderness were developed by John Dwyer (1978). Dr. Dwyer surveyed the existing empirical studies and established a likely range of willingness to pay values associated with different types of recreation throughout the country. The wildlife values were developed by a U.S. Forest Service team (Schweitzer et. al. 1980) in a similar manner. Since wilderness designation is likely to affect primarily dispersed rather than developed recreation only dispersed recreation values will be given. If designation or nondesignation would affect developed recreation sites then these values can be found in U.S. Forest Service (1980).

Advantage: Use of R.P.A. values has the advantage of being documented dollar values being used by another major Federal land management agency. They are of course easy to use in studies and require little time for application. When the BLM area provides a similar recreation experience compared to Forest Service areas in that Forest Service region, the RPA values serve as a useful indicator of likely resource values.

Disadvantages: The R.P.A. values are fixed by Forest Service Region and do not vary by the quality of recreation experience provided or the sites location from population centers. If the study area lands do not provide similar recreation experience as Forest Service lands then the RPA values may not be as appropriate.

Data Requirements: The analyst must have only the RPA values for the Forest Service Region in which the study area belongs and an estimate of recreation Visitor Days. The product of these two yield an estimate of recreation benefits.

Data Sources: The data are provided by resource for each of the relevant Forest Service Region (except for wildlife recreation which does not vary by Region). These values are from U.S. Forest Service (1980).

Dispersed Recreation:

Region 1 (Montana, North Idaho, South Dakota)	$3.00 per RVD
Region 2 (Colorado and Wyoming)	$3.00 per RVD
Region 3 (Arizona and New Mexico)	$3.00 per RVD
Region 4 (South Idaho, Nevada and Utah)	$3.00 per RVD
Region 5 (California)	$5.50 per RVD
Region 6 (Oregon and Washington)	$3.00 per RVD

Wildlife:

Big game hunting:	$10.50 per RVD
Nongame hunting:	$ 7.25 per RVD
Sport fishing:	$ 5.25 per RVD
Waterfowl hunting:	$ 8.00 per RVD

Wilderness:

Region 1 (Montana, North Dakota, North Idaho)	$ 8.00 a RVD
Region 2 (Colorado, Wyoming, South Dakota)	$ 8.00 a RVD
Region 3 (Arizona, New Mexico)	$ 8.00 a RVD
Region 4 (South Idaho, Utah, Nevada)	$ 8.00 a RVD
Region 5 (California)	$10.00 a RVD
Region 6 (Oregon, Washington)	$ 8.00 a RVD

Note that in 1985, the U.S. Forest Service may be updating these RPA values for their 1985 RPA.

3. U.S. WATER RESOURCES COUNCIL UNIT DAY VALUE METHOD

General: The Unit Day Values (UDV) represent the net willingness to pay or net benefits of general or specialized recreation. For general or dispersed type recreation the benefits range from 1.50 to 4.50. The specialized recreation benefits range from 6.10 to 17.90 (Both Water Resources Council, 1981).

To use the UDV method the analyst must determine whether the recreation activity under study is general-dispersed or specialized. Water Resources Council (1979) provides some guidance in making this distinction. If the recreation activity does not require high user skill or knowledge and that recreation activity is commonly found in the region then it is considered general recreation. Specialized recreation involves high user skill or knowledge and is an activity not found commonly in the area. In addition to this description the Water Resources council classifies big game hunting, river trips and wilderness type hunting-backpacking as specialized recreation (Water

Resources Council, 1979). Other recreation is normally considered "General" recreation. Once a determination is made with regard to the specialized versus general category, the analyst still must determine which dollar value to select within the given range. The way the analyst selects the appropriate dollar amount within the range is to rate or evaluate the study areas recreation attributes against 5 components.

These components are:

1. Recreation experience
2. Availability of the opportunity (or success at hunting or fishing for wildlife activities)
3. Carrying capacity
4. Access
5. Environmental quality

Each of these components has a maximum number of points. The analysts assign points to each component by judgmentally rating the quality of each component at the site. The points assigned to each component then are summed to identify the specific dollar value to select from the range of values provided by WRC. This rating system feature allows the analyst to refine the range of recreation values in accordance with the study areas recreation characteristics. High quality component ratings would result, for example, in higher points and higher dollar values.

Advantages: The method is approved for limited use by Federal agencies in recreation studies by the U.S. Water Resources Council. The method is easy to apply in that the data requirements and calculations are few in number.

The judgment factors provide flexibility to allow the recreation values to reflect area recreation characteristics. For this reason, this approach is somewhat better than the RPA valuation approach.

Disadvantages: The application of the five judgment factors is subjective and can appear arbitrary unless each step can be justified. While the range of dollar values provided for general and specialized recreation may appear reasonable, these values do not reflect any particular empirical study. They are best guesses without much base in fact.

The unit day values are intended to present a likely value and not in precise measure of recreation values. For a more precise estimate of the dollar value, a Travel Cost Method must be employed.

Data Requirements and Sources: The data requirements include the 5 judgment factors, the point to dollar conversion table and knowledge of how the WSA under study relates to the 5 judgment factors. The judgment factors are presented in the following tables from Water Resources Council (1979). The Point Dollar Conversion Table from Water Resources Council (1980) is provided in the next table.

Revised Table K-3-1 (FY 1982) - Conversion of Points to Dollar Values

Activity Categories	POINT VALUES										
	0	10	20	30	40	50	60	70	80	90	100
General Recreation (Points from Table K-3 2)	1.50	1.80	2.00	2.30	2.80	3.20	3.50	3.70	4.00	4.30	4.50
General Fishing & Hunting (Points from Table K-3 2)	2.20	2.40	2.60	2.90	3.20	3.50	3.90	4.00	4.30	4.40	4.50
Specialized Fishing & Hunting (Points from Table K-3 3)	10.50	10.80	11.00	11.30	11.60	12.70	13.80	14.70	15.80	16.90	17.90
Specialized Recreation Other than Fishing & Hunting (Points from Table K-3 3)	6.10	6.50	7.00	7.50	8.00	9.00	10.00	12.00	14.00	16.00	17.90

Note: See 44 FR 72963-64 (published December 14, 1979) for Table K-3-2 and K-3-3.

Table K-3 2 – Guidelines for Assigning Points for General Recreation

Criteria	Judgment Factors				
a) Recreation Experience	Two general activities 3/	Several general activities	Several general activities; one high quality value activity 4/	Several general activities; more than one high quality high activity	Numerous hig quality valu activities; some general activities
T[illegible]l Points: 30 Point Value:	0–4	5–10	11–16	17–23	24–30
b) Availability of Opportunity 7/	Several within 1 hr. travel time; a few within 30 min. travel time	Several within 1 hr. travel time; none within 30 min. travel time	One or two within 1 hr. travel time; none within 45 min. travel time	None within 1 hr. travel time	None within 2 hr. travel time
Total Points: 18 Point Value:	0–3	4–6	7–10	11–14	15–18
c) Carrying Capacity 1/	Minimum facility development for public health and safety	Basic facilities to conduct activity(ies)	Adequate facilities to conduct without deterioration of the resource or activity experience	Optimum facilities to conduct activity at site potential	Ultimate facilities t achieve intent of selected alternative
Total Points: 14 Point Value:	0–2	3–5	6–8	9–11	12–14
d) Accessibility	Limited access by any means to site or within site	Fair access poor quality roads to site; limited access within site	Fair access, fair road to site; fair access, good roads within site	Good access, good roads to site; fair access, good roads within site	Good access, high standar road to site; good access within site
Total [illegible]ints: 18 Point Value:	0–3	4–6	7–10	11–14	15–18
e) Environmental Quality	Low esthetic factors 5/ exist that significantly lower quality 6/	Average esthetic quality; factors exist that lower quality to minor degree	Above average esthetic quality; any limiting factors can be reasonably rectified	High esthetic quality; no factors exist that lower quality	Outstanding esthetic quality; no factors exis that lower quality
Total Points: 20 Point Value:	0–2	3–6	7–10	11–15	16–20

1/ Value should be adjusted for overuse.

2/ Value for water-oriented activities should be adjusted if significant seasonal water level changes occur.

3/ General activities include those that are common to the region and that are usually of normal quality. This includes picnicking, camping, hiking, riding, cycling, and fishing and hunting of normal quality.

4/ High quality value activities include those that are not common to the region and/or Nation and that are usually of high quality.

5/ Major esthetic qualities to be considered include geology and topography, water, and vegetation.

6/ Factors to be considered in lowering quality include air and water pollution, pests, poor climate, and unsightly adjacent areas.

7/ Likelihood of success at fishing and hunting.

8/ Intensity of use for activity.

Table K-3 3 - Guidelines for Assigning Points for Specialized Recreation

Criteria	Judgment Factors				
a) Recreation Experience 8/	Heavy use or frequent crowding or other interference with use	Moderate use, other users evident and likely to interfere with use	Moderate use, some evidence of other users and occasional interference with use due to crowding	Usually little evidence of other users, rarely if ever crowded	Very low evidence of other users, never crowded
Total Points: 30 Point Value:	0–4	5–10	11–16	17–23	24–30
b) Availability of Opportunity 7/	Several within 1 hr. travel time; a few within 30 min. travel time	Several within 1 hr. travel time; none within 30 min. travel time	One or two within 1 hr. travel time; none within 45 min. travel time	None within 1 hr. travel time	None within 2 hr. travel time
Total Points: 18 Point Value:	0–3	4–6	7–10	11–14	15–18
c) Carrying Capacity 1/	Minimum facility development for public health and safety	Basic facilities to conduct activity(ies)	Adequate facilities to conduct without deterioration of the resource or activity experience	Optimum facilities to conduct activity at site potential	Ultimate facilities to achieve intent of selected alternative
Total Points: 14 Point Value:	0–2	3–5	6–8	9–11	12–14
d) Accessibility	Limited access by any means to site or within site	Fair access, poor quality roads to site; limited access within site	Fair access, fair road to site, fair access, good roads within site	Good access, good roads to site; fair access, good roads within site	Good access, high standard road to site; good access within site
Total Points: 18 Point Value:	0–3	4–6	7–10	11–14	15–18
e) Environmental Quality	Low esthetic factors 5/ exist that significantly lower quality 6/	Average esthetic quality; factors exist that lower quality to minor degree	Above average esthetic quality; any limiting factors can be reasonably rectified	High esthetic quality; no factors exist that lower quality	Outstanding esthetic quality; no factors exist that lower quality
Total Points: 20 Point Value:	0–2	3–6	7–10	11–15	16–20

1/ Value should be adjusted for overuse.

2/ Value for water-oriented activities should be adjusted if significant seasonal water level changes occur.

3/ General activities include those that are common to the region and that are usually of normal quality. This includes picnicking, camping, hiking, riding, cycling, and fishing and hunting of normal quality.

4/ High quality value activities include those that are not common to the region and/or Nation and that are usually of high quality.

5/ Major esthetic qualities to be considered include geology and topography, water, and vegetation.

Factors to be considered in lowering quality include air and water pollution, pests, poor climate, and unsightly adjacent areas.

Likelihood of success at fishing and hunting.

Intensity of use for activity.

4. SIMILAR SITE TRAVEL COST METHOD FOR BENEFIT ESTIMATION

General: The Travel Cost Method (TCM) in addition to estimating recreation use also can estimate recreation benefits. That is, once you have a per capita demand curve for use estimation only three additional steps are necessary to derive a benefit estimate. Since the analyst is often interested in both the recreation benefits and use gained or lost due to designation or nondesignation, the TCM is helpful in that it provides both these estimates using the same conceptual framework. As with the similar site TCM for use estimation the analyst must acquire or estimate a per capita demand curve for recreation activities and areas similar to the one under study. The more closely the area under study matches the one for which the analyst has the per capita demand curve the more accurate the resulting benefit estimate will be.

Advantages: The TCM is approved for use by Federal agencies by the U.S. Water Resources Council (Water Resources Council 1979). The method estimates demand and benefits in a manner consistent with economic theory of consumer behavior.

Use of the TCM equation will automatically take into account the spatial location of the area under study relative to population centers and the site attractiveness for that recreation activity.

Disadvantages: The benefit estimates will be accurate only if the area under study provides a similar recreation experience as compared to the area for which the per capita demand curve exists. As in use estimation attention should be paid to acreage differences between the area under study and the one which has the per capita demand curve. If they are quite different in terms of useable recreation area, the benefits must be scaled by acreage.

The accuracy of the benefit estimates depends on the statistical power of the original TCM per capita demand curve. The higher the R^2, F value and "T" statistics of the original per capita demand curve the more confidence the analyst can place in the benefit estimates derived.

In some cases, the available TCM demand equations will not exhibit the desired statistical reliability. Here the choices are to:

1. Have an "expert" examine the raw data and suggest alternative functional forms and variables that would improve the statistical reliability.

2. Use another method such as the Unit Day Value Approach.

3. Collect WSA specific data and use these data to estimate the TCM equation for the area under study. This alternative will be

discussed in the next section.

Data Requirements: The similar site approach requires either:

1. An existing per capita demand curve for an area and recreation activities similar to the area under study or

2. Visitor origin data (i.e., the city, county, or zip code of visitor residence), an atlas, and basic knowledge of a statistical regression package to estimate a TCM equation for an area similar to the WSA under study. Dwyer, Kelly and Bowes (1977) as well as Bowes and Loomis (1980) would be helpful if this approach is attempted.

Data Sources: Existing per capita demand curves for wilderness, wildlife, and other recreation activities can be found in technical journals such as Land Economics, Journal of Leisure Research, Journal of Environmental Economics and Management, American Journal of Agricultural Economics and Western Journal of Agricultural Economics. The article's author may need to be contacted if the details of the structure of the per capita demand function are not clear (e.g., cents per mile, vlaue of travel time).

Masters theses, Doctoral Dissertations and work in progress at universities such as Oregon State, Utah State, University of Arizona, Colorado State, University of New Mexico, New Mexico State University and University of Wyoming also may contain applicable per capita demand curves.

Two such unpublished per capita demand curves applicable to desert-canyon type wilderness are Grand Gulch and Paria Canyon Primitive Areas. These were presented in the Similar Site TCM for use estimation section earlier. Briefly they represent an early effort (Loomis 1979 and 1980) to estimate recreation benefits at Grand Gulch and Paria Canyon Primitive Areas. The per capita demand curves are the same as in the use estimation section.

To estimate benefits the following steps are required:

The first three steps of the application of a similar site TCM equation are followed so that visitation from each zone at the zones travel cost is calculated.

To estimate benefits, a fourth step is necessary. That is, once you have replaced the initial travel cost in the equation and have estimated total use from that origin at the current travel cost, you now need to repeat the process wih hypothetically higher travel costs for that origin. Specifically, you add a hypothetical fee to the current travel costs and re-estimate total zone or origin visitation at that fee. By adding successively higher fes, you will eventually raise the travel cost to the level where visitation becomes zero (or negative). By arranging the visitation estimates and their corresponding fees you have traced out that origin's demand schedule. Repeating the process for the other zones of origin and horizontally summing (adding up the visits from all zones at a given fee) will yield the WSA's demand schedule.

The last step is to take the area under that demand schedule. This amount is the dollar benefits to recreationists from having that WSA to engage in wilderness recreation.

To clarify these steps we will continue with our example from the TCM similar site use estimation section: Given TCM equation is T/pop= .01543-.00226 TOTC (in hundreds of dollars).

The data for Salt Lake City were:

Existing travel cost (in hundreds) = 1.068
Population (in 1,000 is) = 758

Our estimate of use at no additional travel cost is
T/pop = .01543 -.00226 (1.068)

T/pop = .013
Trips = (.013)(758) = 9.8

Next we add $50 to the original travel cost and re-estimate trips.

T/pop = .01543-.00226 (1.068 + .5)
T/pop = (.0118)
Trips = (.0118)(758) = 8.9

Repeating this process we add $100 to the original travel cost

T/pop = .01543-.00226 (1.068 + 1.0)
T/pop = (.0107)
Trips = (.0107)(758) = 8.1

By repeating this process until the added fee equals $575 (at which point T/pop = 0, we have the following schedule:

APPENDIX 2: CALCULATOR PROGRAM FOR USING THE JUNGST EQUATION

Purpose: If the analyst chooses to apply the Jungst equation on numerous WSA's, this program should save significant calculation time. The program is designed for a Texas Instrument, TI-59/58. However, the general approach is applicable to Hewlett Packard programmable calculators as well.

Steps to utilize Program on TI-59/58 are as follows:

Step 1: Review basic operating instructions of calculator and use of calculators memories.

Step 2: Program Calculator

1. Turn on calculator.
2. Hit the Learn or LRN button.
3. Type in attached program exactly as shown.
4. Store the intercept (including the negative sign) for the F.S. Region that your study area is in, in STO 01.
5. Store the current acreage of wilderness in that F.S. Region in STO 02.

6. Store the current population in that F.S. Region in STO 03.
7. Store the current median family income for that F.S. Region in STO 04.
8. Store the current median education in STO 05.
9. Store the coefficient on acreage in STO 12.
10. Store the coefficient on population in STO 13.
11. Store the coefficient on income in STO 14.
12. Store the coefficient on education in STO 15.

Step 3: Running the Program

By pressing the R/S button the program will "run". The value displayed is estimated gross Recreation Visitor Days in 1980 for the without designation scenario in that Forest Service Region.

To get estimated gross Recreation Visitor Days with designation of a particular WSA in 1980 the analyst must add the WSA acreage to the amount in STO 02. This can be accomplished by entering the acreage and then using the SUM 02 command. Now hitting the R/S button will cause the new estimated gross Recreation Visitor Days with designation to be displayed.

Subtraction of the without scenario RVD's from this new level of RVD's (with designation case) yields an estimate of RVD's for designation of that specific WSA.

To obtain future with and without designation values, the population, income and education variables are increased to their respective future levels. To obtain change in RVD's in those future years the acreage variable is changed from the current amount by the acreage of the WSA under consideration.

JUNGST PROGRAM

```
LRN
(
RCL
02
2nd Log
X
RCL
12
)
+
(
RCL
03
2nd Log
X
RCL
13
)
+
(
RCL
04
2nd Log
X
RCL
14
)
+
(
RCL
05
2nd Log
X
RCL
15
)
=
+
RCL
01
=
INV
2nd
Log
PRT (if using a printer, otherwise do not use this command)
R/S
RST
LRN
```

Additional Fee	Trips
0	9.8
50	8.9
100	8.1
200	6.4
300	4.7
400	3.0
500	1.3
575	0

This schedule is horizontally added to schedules derived in the same manner for the other zones. For example, if there were only 3 zones:

Additional Fee	Salt Lake City	Moab*	Arizona*	Total
0	9.8	4.5	28	42.3
50	8.9	4.0	21	33.7
100	8.1	3.5	16	27.6
200	6.4	3.0	10	19.4
300	4.7	2.7	5	12.4
400	3.0	1.8	2	6.8
500	1.3	1.5	0	2.8
575	0	1.2		1.2
600		.5		.5
650		0		0

---

*The data for these two zones are hypothetical and not derived from the TCM equation.

By taking the area under this total demand schedule, we would find the benefits. It is simply approximated here as $13,747 or as $325 a trip or $9.80 a visitor day.

Note that the use estimate at the zero additional fee (here 42.3) is what you would use as your use estimate for trips in applying the TCM equation for similar site estimation.

Two cautionary notes are in order. While it is not too difficult to generate WSA specific benefit estimates using either the Grande Gulch or Paria Canyon TCM equations, their statistical reliability is only .70% and .90% respectively. While this is greater statistical reliability than by be generated with RPA or UDV approaches (since you cannot statistically estimate their degree of reliability) and also much greater reliability than some minerals data, it may be desirable for WSA's with high resource conflicts to do better than 70% level of reliability. Such an approach will addressed in the next section.

Second, the areas being compared must have similar useable areas for recreation (acres). If they do not, the use and benefit estimates should be prorated by acres. For example, if the area that was compared to Grand Gulch in the example had only 13,000 acres (about half as big as Grand Gulch) total benefits would likely be about $6,873 a year rather than $13,747. However, the benefits per day are still $9.80, its just that capacity or use will be fewer visitor days with the smaller area, all other things remaining equal and total value will be smaller. Also the areas should be similar in recreation experience, topography, and access.

5. SITE SPECIFIC TRAVEL COST METHOD FOR RECREATION BENEFIT ESTIMATION

General: A Travel Cost Method (TCM) in addition to being suitable to estimate dispersed recreation use also can estimate the dollar value of recreation to the user. The general form of a zonal travel cost model is visits per capita as a function of round trip travel cost, availability of substitutes, and socioeconomic variables such as income, occupation, age, etc. The interested reader should consult Dwyer, Kelly and Bowes (1977) or Clawson and Knetsch (1966) for a discussion of this methodology.

Advantages: The TCM is one of the standard empirical approaches to estimating both recreation benefits and use. It is a conceptually and theoretically sound method. The method is used by researchers and economist-recreation planners in other government agencies. The TCM is approved for use by Federal agencies (Water Resources Council, 1979).

The site specific TCM approach will automatically take account of recreation sites spatial location relative to surrounding population centers as well as the areas recreation characteristics, but for forecasting use it will be necessary to forecast change in spatial location of recreation sites.

The methodology is appropriate when a majority of the recreationists visit the area as the primary purpose of their trip. If multi-destination recreationists represent a large proportion of site use, the methodology may need to be modified (see Smith and Kopp, 1980).

Disadvantages: If the area of recreation is very close to a very large population center such that almost all users are local, then

TCM estimates of benefits will be understatements of the true benefits of recreation. The understatement occurs because the variation on travel distances is insufficient to reflect the recreationists willingness to pay. However, the primary weakness of TCM is in meeting the requirement for specific origin-destination data. This will be discussed in the next section.

Data Requirements: The TCM requires knowledge of the recreationists origin or point of residence (city, county, or zip code is sufficient). The "prices" paid for recreation are estimated by computing the travel cost from the recreationists origin to the recreation area under study. Based on these prices paid, a consumer surplus or net willingness to pay can be estimated in a fashion similar to that of a market good in a cross sectional demand study. An alternative to having visitor origin data is knowing the travel cost or distance the recreationist traveled to the recreation area and the number of times they visited the area in the last year. This will allow estimation of an individual observation TCM equation (Brown and Nawas, 1973). Knowledge of the availability of substitute recreation sites also is required. Information on party size (number of people in the vehicle), income, education, number of years experience is desirable but not necessary for using the TCM. If congestion at current areas exist, the travel cost model should account for this variable.

Data Sources: Visitor registers and use permits serve as useful secondary sources of recreationists origin data. Land grant universities such as Utah State University's Institute for Outdoor Recreation and Tourism often collect this type of data as part of an overall recreation survey. They will often disaggregate the finished data by origin of recreationist at the cost of the programming and computer time. These disaggregated data are amenable to TCM application.

In some instances, the Department of Economics or Recreation Resources of land grant universities may have existing survey data that can be utilized in travel cost method analyses.

Most State Fish and Game or Divisions of Wildlife Resources have the type of origin-destination data necessary to use the TCM. While it may not be accessible in published reports, the departments have the data on computer cards or tapes andmay be willing to provide the information at no or minimal charge. The State Fish and Game routinely collect these data from their own surveys or from hunter application data. The quality of the data is usually quite good and for some species represents 100% of the users rather than just a sample.

C. ESTIMATING GRAZING AND LIVESTOCK VALUES

General: Several methods of estimating the economic benefits of AUM's exist. Some of the more well known techniques are presented briefly here so as to insure comparability between AUM values and non-market resource values such as recreation.

Since grazing is allowed in Wilderness Areas, the analyst must be quite explicit in defining the with and without scenarios. Wilderness designation, for example, may place restrictions on the type of range improvements. However, care must be taken in determining whether such range improvements would have been economic in the absence of designation. If the Allotment Management Plan Benefit-Cost analysis would show such range improvements as being uneconomic then, restricting such improvements does not involve economic losses; it offers an economic gain.

When evaluating the without designation scenario, attention must be paid to the likely future course of events in the area under study. Energy development which might follow nondesignation also could result in possible losses in AUM's. In this case designation, by maintaining the current level of grazing would provide some positive livestock benefits.

1. RESOURCES PLANNING ACT VALUES

General: Using a formula which incorporates the price of hay and grazing conditions, the Forest Service has estimated the net willingness to pay or economic value of AUM's in each of its Forest Service regions.

Advantages: The dollar value per region can be used as a documented source of the value of an AUM. Since the dollar values are given, this approach is quick and simple. This approach would be particularly useful if the allotment affected is similar to Forest Service allotments in that region.

Disadvantages: The dollar value of Forest Service AUM's is probably higher than found on average BLM land in terms of AUM's per acre and nutritional value (TDN). A single Forest Service value for the whole region is not sensitive to local variations or seasonal differences.

Data Requirements: No data are required other than determination of the Forest Service region in which the WSA is located and the dollar value per AUM for that region.

Data Sources: The values by Forest Service region from the 1980 RPA can be found in U.S. Forest Service (1980) and are given here for convenience:

Region 1 - Montana, North Dakota, and northern Idaho	$5.57 per AUM
Region 2 - Colorado, Wyoming, and South Dakota	$5.88 per AUM
Region 3 - Arizona and New Mexico	$5.51 per AUM
Region 4 - Nevada, Utah, and southern Idaho	$4.96 per AUM
Region 5 - California	$6.00 per AUM
Region 6 - Oregon and Washington	$5.90 per AUM

2. PRIVATE LAND LEASE RATES

General: This is the amount ranchers in the general area are willing to pay per AUM to rent private nonirrigated pasture in that area. Since ranchers are unlikely to pay more than the net income they are going to receive from the use of an AUM, this lease or rental rate represents a maximum willingness to pay. Private lease rates used should be as comparable as possible to the public forage output under evaluation.

Advantages: Since values can be based on market transactions in the geographic area and even season of availability, the dollar values could potentially be made specific to the general geographic area under study.

Disadvantages: Private land lease rates often reflect services performed by the leasor that are not provided on public lands. In addition, the AUM's per acre and nutrition (TDN) on private lands are often higher than on public land. Leased private forage may differ from public forage in season and other respects. The private land lease rates will often serve as a maximum value per AUM in the area.

Data Requirements and Data Sources: The only data requirements for this method are to find transactions on private land leases. These can often be found through Range Science or Agricultural Economics Departments at the University of Nevada, the University of Arizona, Colorado State University, and Utah State University. Both the U.S.D.A. Statistical Reporting Service (SRS) and Economic Research Service also have such data on private lease rates.

3. CHANGE IN NET INCOME (SHADOW PRICE)

General: Using either ranch budgets or a range budgets-linear programming combination, the change in net income due to wilderness designation can be estimated. Operationally, the change in revenue is estimated as a result of designation. The change in costs also are estimated. The difference is of course the change in net income. The change in net income is intended to reflect the maximum amount that a rancher would pay for these AUM's.

Advantages: This approach is a conceptually sound method that, given suitable data, can more realistically estimate the value of AUM's to public land ranchers than any other technique. This is due to the ability of this method to estimate directly the production and income of public land ranchers.

Disadvantages: This approach requires much better data, ranch-specific data, and thus is more costly to employ.

Data Requirements: Detailed ranch budget data by class size of operator and season of use information are required.

Data Sources: This information is available in some areas from Economic Research Service of the U.S. Department of Agriculture. Departments of Range Science, such as the University of Arizona, the University of Nevada, and Utah and Colorado State Universities, have such information as well. Some recent BLM grazing EIS's in which the rancher analysis was done by Economic Research Service, U.S.D.A., also have net income per AUM's based on this method.

D. ESTIMATING TIMBER VALUES

General: This section will describe the outputs needed for comparison between timber and other resources.

From the existing management strategies, estimate the allowable cut that will be lost due to designation. Next take the average bid for this type of timber in this type of location as an estimate of the net value of the timber. Using the harvest schedule that would be implemented in absence of designation and the allowable cut from above, calculate the cash flow over a 50 to 100-year period. Lastly, discount the cash flow to the current period using either the Water Resources Council discount rate (currently 7 5/8%) or mandated discount rate from OMB. Net out the costs to the public agency of the timber harvest. This final figure will reflect the net benefits of the timber foregone or the timber opportunity cost of the timber. In some cases the public agency costs will exceed the timber revenues, in which case the foregone timber would show as a net benefit. Some of these data may be obtained from BLM Forestry Reports.

E. ESTIMATING MINERAL VALUES

General: Mineral deposits may be found underlying some WSA's. When this occurs it is important to distinguish between physical presence, actual or inferred, and an "economic" presence. Physical presence is unimportant if the resource is currently uneconomic to develop. In cases where minerals are present but uneconomic to develop there is no minerals opportunity cost at present since with or without designation they are not likely to be developed. The BLM GEM report and subsequent analysis may provide some of the necessary data to determine whether there is a physical presence and whether that physical presence will translate into a current economic presence.

Determination of whether a particular mineral is currently economic to develop or not is often made using a Discounted Cash Flow model (U.S. Department of Interior, 1979). In this approach the time stream of revenue and costs of development are discounted and then compared. While this standard technique is simple in concept it may be difficult in practice to apply since data on revenues and costs for mineral development in WSA's are difficult to obtain. The BLM's Guidelines for GEM Resources report may contain some of the necessary physical data and references to assist in determining whether the minerals resource warrants application of the discounted cash flow model. However, most GEM information will be more general in nature.

One problem underlying all mineral evaluation techniques is the great uncertainty about the quantity and quality of minerals present in the area under study. This problem also applies to the discounted flow method. There are two ways to reduce this problem. One is to use the Alternative Cost Method. This approach will be discussed in the next section. The other approach is to combine Probabilistic Methods with the discounted cash flow approach. This particular combination seems widespread, ranging in application from simple approaches to elaborate simulation modeling. Probability analysis ".. is based on the premise that the expression of a range of values in establishing an estimate for a parameter is more realistic than choice of a single value" (Bennett, et al, 1970).

Two variants of the discounted cash flow model with probability analysis will be presented next.

1. PROBABILITY ANALYSIS WITH ONLY Geology, Energy and Minerals (GEM) TECHNICAL REPORT AND SUBSEQUENT ANALYSIS

General: The technique here draws upon a presentation in Howe (1979) on the application of Probability Analysis using pre-drilling exploration data. The idea is to calculate the probabilities of the amount of reserves likely present in the deposit. Primarily, all is needed is to narrow the reserves down to an order of magnitude. That is, are the most likely recoverable reserves 100,000 tons (or barrels), 1 million tons, or 10 million tons? For example, the geologist might state that there is a low probability that 50,000 tons of coal could be recovered annually from the portion of the deposit lying within the WSA. We might assign a 20% or .2 probability to this "low probability" estimate.

The geologist might state that there is a most likely or probable case of 20,000 tons recoverable annually. Here we might assign a .5 probability.

Lastly, the geologist might indicate a low probability, but greater than the first case, that there are 10,000 tons recoverable annually. This would be .3 probability (the sum of the probabilities must, of course, equal 1).

The expected annual mineral productions, assuming constant production overtime, is:

$(50,000 \text{ x}.2) + (20,000 \text{ x } .5) + (10,000 \text{ x } .3)$ or, 23,000 tons annually

The variance of annual mineral production is given by the expected value of the squared estimates of the annual recoverable tons minus the squared value of the expected annual mineral production. This is given by:

$(50,000)^2 \text{ x } .2 + (20,000)^2 \text{ x } .5 + (10,000)^2 \text{ x } .3 - (23,000)^2 =$ 1,000,000.

The square root of the variance is called the standard deviation. In this case the value of the standard deviation is 1,000. The expected value gives a good point estimate for the decisionmaker. When feasible, the expected value plus or minus the standard deviation, in this case 24,000 to 22,000, should also be given, so that the decisionmaker has a range of most likely values on which to base his decision. This range attempts to quantify the uncertainty associated with the expected value estimate.

The next step is to multiply this expected amount of annual production times the net value of the coal. If coal in that area for that quality sells for \$25 a ton (at the mine) and costs are \$20 a ton to mine and process it then the net value is \$5 a ton.

Thus, the expected annual net dollar benefits of development, assuming constant prices and costs over time would be \$5 x 23,000 or \$115,000 annually. The range of net benefit estimates would be \$5 x 22,000 to \$5 x 24,000 or \$110,000 to \$120,000 annually.

The next step is to determine the likely start up time and life of the mine at the rate of production assumed earlier (Krutilla and Fisher, 1975).

That is, given the amount of mineral already leased or available outside this WSA, when would the demand for this mineral necessitate development of this particular reserve. If there is sufficient capacity in currently operating mines to meet the anticipated demand for the next 20 years, then development likely would not take place for at least 20 years.

Alternatively, if there are several leases for that mineral in areas outside the WSA that have not yet been developed, then increases in demand can be met by these leases if they are lower cost deposits, without having to develop the resource within the WSA for 230-40 years. Once this is estimated the Net Present Value of development can be calculated. If the other leases are not lower cost deposits, then there is a cost of postponement.

To continue our example, assume the coal in this WSA likely would not be developed in 20 years and would have a 30 year life. (These numbers again could be estimated using probability analyses). The formula for the present value at a constant stream of income discounted at a given rate i starting in year x and continuing until year n is given by:

$$(1+i)^{n+1-x} -1/i\ (1+i)^{n}.$$

The value of this factor in our example when x=20, n=50, and i.0735 is therefore:

$$(1.0735)^{31} -1/.0735\ (1.0735)^{50}=8.0129/2.5491=3.1434.$$

Multiplying this factor by the expected net revenue estimate yields Expected Net Present Value estimate (or expected benefit today) of $361,491. The range of Net Present Value estimates is given by:

3.1434 x ($110,000) to 3.1434 x ($120,000) or $345,774 to $377,208.

The Expected Net Present Value estimate, $361,491 gives a point estimate of the net benefits from development or the opportunity costs of nondevelopment. The range of Net Present Value estimates gives a reasonable estimate of the uncertainty surrounding these benefits or opportunity costs.

Lastly, this Expected Net Present Value, and the end points of the range, of the opportunity cost would be added to any other compitable nonwilderness activities, e.g., timber and grazing if they can be done concurrently and be compared to the Net Present Value of Wilderness Recreation, Preservation Value, Wildlife Recreation and Water Quality Benefits (if any) to determine whether the benefits of wilderness are greater than the costs. Based on these data a preliminary recommendation can be made, on economic efficiency grounds, regarding desigation. However, other benefits and costs must be thoroughly examined before conclusions can be drawn (see Wilderness Study Policy criterion and quality standards).

Advantages: This approach will maximize the use of GEM technical report and other associated data. This approach will provide a correct estimate of the net benefits of minerals foregone from wilderness designation under the assumption of constant demand. However, the results themselves should be stated as a range of the net benefits of development.

Disadvantages: This approach will provide only a rough approximation of the potential values. While the tool will provide, on average, a useful approximation, the technique, of course, has a large variance for any specific area - or one application. This problem inherent in the poor quality of data that may be used with the tool rather than the tool itself. The assumption of constant demand is a problem if in fact, the evidence indicates a forecast of increased demand.

Data Requirements and Data Sources:

The main item of information is the GEM Technical Report and other data incorporated into the planning document.

Data source: Although few estimates of willingness to pay currently exist, several universities in the west such as University of New Mexico, New Mexico State University, University of Arizona, University of Wyoming, Utah State University, and Colorado State University could provide such data on a contract basis.

If the Bureau decided to perform its own survey or sponsor a survey, OMB clearance would be necessary.

D. TECHNIQUES FOR ESTIMATING THE ON-SITE AND OFF-SITE VALUES OF WATER QUALITY

General: One possible method of maintaining water quality is wilderness designation. Therefore, water quality protection and maintenance may be addressed as on-site and off-site benefit. An example might be if the nondesignation condition is mineral exploration, then designation would be responsible for generating the added dollar value of preserving water quality.

The added value of water quality takes several forms including recreation and presevation values and cost savings of treatment for water users downstream.

Data Source: The model could easily be installed and operated on BLM's Honeywell computer since the model is written in Fortran II and requires only 8K of core memory. The program likely could be operated on a minicomputer (Apple, Radio Shack) since only 8K is required.

The report by Bennet et al (1970) provides some cost figures on operating a mine. The Bureau of Mines (Data Analysis and Standards Development) also has a handbook that presents capital and operating costs for mining and processing of metallic and nonmetallic minerals (except fossil fuels). (See U.S. Bureau of Mines (1979) for further information).

3. ALTERNATIVE COST TECHNIQUE

General: If certain conditions are met, the difference in cost of alternative sources of a mineral can be used to estimate the net benefits of the mineral foregone due to wilderness designation.

The most important condition for applying the Alternative Cost approach is that there is a known demand for that mineral from that WSA in the next few years (say 5 or less). Specifically, that the mineral resource from that WSA is less costly than other sources of that mineral for that known project (powerplant) or market.

It is important to visualize a sequence in which deposits will be exploited since the more economical deposits would be used to meet that known market or project demand. The magnitude of the loss will depend on how soon the reserves in the study area would be required in the sequence. The sooner needed the larger the loss would be.

If the minerals in that WSA are the most inexpensive source, then the Alternative Cost approach can be used in its simplest form to estimate the net benefits of minerals foregone due to wilderness designation by simply using the costs of the next best source of the mineral and not considering a possibly complex sequence of deposit extractions.

Here, the analyst would estimate the difference in the cost of the mineral to a project or to the final users from acquisition of the mineral from the next most economical source. This difference in cost or price of the mineral resource becomes the net benefits foregone due to designation.

For example, assume coal can be supplied to a proposed powerplant form reserves in a WSA at $20 a ton. The next closest or cheapest source of supply for that coal would cost the powerplant $22 a ton (due to, say, greater distance that the other coal must be transported) then the net loss from designation is $2 a ton times either the recoverable reserves of the WSA or the life time demand of the powerplant (Use whichever is the smaller amount.) The $2 represents the sum of the private losses to coal producers and consumers due to the higher coal cost.

Advantages: The technique is relatively easy to use in terms of mechanics and minimal data required. Most of these data were generated already as part of the utilities plant siting decision or a company's reason to exploit this deposit over some other deposit.

When the conditions for application are met, the method provides an accurate estimate of the net benefit foregone.

Disadvantage: For speculative deposits the least cost approach may overstate the net benefits foregone since the deposit under consideration actually could turn out to be more costly than some other source. For actual deposits or sequence of deposit extractions may be required.

Data Requirements: Knowledge of the reserves and costs per unit of minerals in the area under study are required. Knowledge of the reserves and costs per unit of alternative sources of this mineral also are needed.

Data Sources: Data sources include the GEM Technical Report data, the GEM references and geologists familiar with the area. In cases where the mineral was to be used by a known company, coordination with them on alternative mineral sources and their costs may be desirable.

IV. TECHNIQUES FOR EVALUATING THE LOCAL INCOME AND EMPLOYMENT EFFECTS

General: Information and techniques presented in this section are relevant for Quality Standard Number 5 of the Wilderness Study Policy. The purpose of measuring changes in local income and employment due to designation is to assess whether a recommendation based on resource values need be qualified by local factors. Local is defined as county or group of counties most affected. "Significance" means a change that crosses a threshold of concern or absolute amount exceeding say a 10% change in that variable. See BLM's Guidance for Social and Economic Analysis of Grazing EIS's. (Instruction Memorandum No. 81-99) for more details.

Specifically, the purpose of this section is to provide data and tools for estimating the direct and indirect change in local income earnings and employment due to wilderness designation or nondesignation.

The tools provided are applicable to both market resources (minerals, timber, etc.) and nonmarket resources (recreation, wildlife, etc.). Discusssions with field personnel indicated a lack of expenditure type data primarily for the nonmarket resources. Since most analysts were familar with the expenditure data for development of market resources, only the expenditure data for nonmarket resource are provided in this manual. It should be stressed that the income and employment effects from both market and nonmarket resource changes must be analyzed and carried through the analysis however. Once again the with and without criterion should provide an indication as to which market and nonmarket resources are relevant for the analysis.

Data on expenditures will be provided first followed by a discussion of the techniques. The data provided here are applicable to all of the techniques presented later.

A. Expenditure Data by Resource

1. Wilderness Recreation

One source of recreationist expenditures specific to wilderness type recreation is Walsh, Gillman, and Loomis (1980). They found a resident expenditure of $16.00 visitor day. Of this, $5.54 was just for transportation. These figures are based on survey of Colorado residents. Visitation was to Forest Service, National Park Service, and BLM roadless areas.

Walsh, Ericson, Arostegrey, and Hansen (1980) estimated that expenditures per day for rafting and kayaking was $30.82 and $11.53, respectively. These data were for 9 rivers in western Colorado.

2. Dispersed Recreation

Dispersed recreation activities include ORV use, snowmobiling, picnicing, rock hounding, camping (not in developed sites), etc. Unfortunately, there are few expenditure data specific to dispersed recreation. Most expenditure data are for tourist expenditures which are a mix of developed or dispersed recreation as well as guided tour related recreation. Thus, the expenditures associated with dispered recreation.

Utah State University's Institute for Outdoor Recreation and Tourism prepares yearly and quarterly reports, detailing expenditures by residents and nonresident tourists. The latest report is for Summer 1980 to Spring 1981 entitled "Utah Tourism - Motor Vehicle Travel". The Institute also will make special disaggregated runs (by county, quarter and activity). In addition, they have information on category or sector of expenditure. In 1975, expenditures were $22.54 a trip. This was broken down as follows:

Category	Percent
Food	25.8%
Lodging	23.0%
Transportation	30.7%
Other Retail	14.4%
Entertainment	5.3%
Services	0.8%

In Idaho, Michaelson and Gilmour (1978) estimated that in the Sawtooth Valley of Idaho, residents spent $38.48 per trip. Nonresidents spent $145.17 a trip. The percentage by category is as follows:

Category	Resident	Nonresident
Vehicle	28.0%	32.4%
Lodging	7.6%	14.0%
Food and Beverage	48.1%	38.8%
Recreation Supplies	7.3%	7.5%
Boat Rental	2.0%	2.5%
Miscellaneous	7.0%	4.7%

In Arizona, Martin, Gum, and Smith (1974) estimated that expenditures per trip for a rural outdoor recreation were $15.50 (in 1970 dollars).

3. Wildlife Recreation

General: The numbers provided are estimates of expenditures by hunters and fishermen. These numbers are of course relevant when the hunting of that species takes place on BLM land. They are also relevant if the hunting does not take place on BLM land, but the BLM land provides critical habitat or winter range which is necessary to support the hunting on the other land. This is particularly true if the limiting factor in the number of animals available for harvest is the habitat type supplied the BLM land under study. Thus, if designation would be lost or degraded, then the expenditures provided in the following pages are relevant.

Arizona [Martin, Gum, and Smith (1974)]

	Expenditure Per Trip (1970)
Deer Hunting	$21.20
Other Big Game	$24.95
Small Game	$ 8.17
Waterfowl Hunting	$10.54
General Hunting	$ 8.97
Coldwater Fishing	$23.31
Warmwater Fishing	$12.59

The next table is the Oregon state average expenditures. Note that Brown and Nawas provide these figures by game management units in Oregon. Expenditures are in 1968 dollars.

Oregon [Brown and Nawas (1973)]

	Expenditure (1968 dollars)	
Species	Per Trip	Per Day
Black-tailed Deer	$ 17.44	$13.83
Mule Deer	$ 51.18	$19.35
Rosevelt Elk	$ 36.62	$20.34
Rocky Mountain Elk	$ 73.58	$19.49
Antelope	$116.33	$19.39

These expenditures were categorized by Brown and Nawas as follows:

Category	Percent
Transportation	31.4%
Lodging or Private Camp Fees	2.2%
Ammunition	7.3%
Food & Beverages	28.2%
Guide Service—Horse Rental	0.4%
Cutting and Wrapping Meat	4.7%
Miscellaneous Expenses	13.2%
Cost of Tags	12.6%

Idaho, Nevada, Utah, and Wyoming values were compiled by Hansen (1977) from U.S. Fish and Wildlife Service, 1975 National Hunting Fishing Survey, Technical Reports for each State. Note the values reported for expenditures were one-half the "Total User Day Value" since the estimates provided had combined expenditures and consumer surplus measures together to give a "gross" total value. Hansen indicated the "split" was about 50-50. Hansen indicates that a User Day has the equivalent meaning as a Visitor Day.

Expenditures per Recreation Visitor Day

Activity	Idaho	Nevada	Utah	Wyoming
Deer	11.47	36.44	20.93	13.39
Elk	20.32	9.66	39.47	21.09
Antelope	9.80	18.66	-	6.63
Other Big Game	21.31	72.50	103.15	32.39
Small Game	11.16	14.65	23.85	6.26
Upland Game	17.68	36.91	12.66	25.00
Waterfowl	7.22	24.24	15.47	33.57
Coldwater Fishing	7.57	12.71	10.61	8.16
Nonconsumptive Use	1.40	0.71	1.68	1.00

Note the 1980 Hunting and Fishing Survey will be completed by Summer 1982 for most States. The expenditure data in this new 1980 report should be more accurate than the 1975 data. For Wyoming, see also Phillips and Ferguson (1977).

The most recent comprehensive study of sportsman expenditure in Colorado was by Ross, Blood, and Nobe (1975). The information was disaggregated into planning zones and was specific by activity. For an analysis putting these expenditures into an input-output format, see McKean (1981).

Dr. John McKean, Department of Economics, Colorado State University, is in the process of doing another survey of Colorado sportsmen expenditures. The Department of Wildlife (Cooperative Fisheries Unit) also is conducting a survey of fisherman expenditures in Colorado.

Other State universities and State Fish and Game Departments have similar unpublished and published data on hunter expenditures.

B. TECHNIQUES

General: The standard technique for developing local employment and income impact assessments is to use an input-output model. To estimate the indirect effects of a large change in direct sales, wages, or employment, the input-output model is activated and the changes estimated. For small direct changes in sales or employment, many input-output models will not be sensitive enough to record the indirect changes. In addition, for such small changes it is not cost effective to run the input-output model. It is more efficient to simply use the model "multipliers" or some other multipliers. The tools presented will start with existing multipliers and then discuss existing input-output models.

1. BUREAU OF ECONOMIC ANALYSIS - WATER RESOURCES COUNCIL REGIONAL MULTIPLIERS

General: The Bureau of Economic Analysis - Water Resources Council (BEA-WRC) regional multipliers are gross output multipliers (Water Resources Council 1977). That is, these multipliers estimate the indirect and induced sales from a direct change in sales. An additional set of "Earnings to Gross Output Ratios" are provided to convert the total change in sales (direct, indirect, and induced) into a change in earnings or income. That is, the change in direct expenditures by tourists can be coverted to a change in direct income or earnings using these Earnings to Gross Output Ratios.

Multipliers are provided for 56 sectors and for 173 BEA areas (the entire U.S.). The multipliers are based on 1973 data and business patterns. The multipliers provided reflect the combined indirect (purchases from supporting industries) and induced effects (local consumption expenditures, i.e., households).

Advantages: The multipliers are available by Bureau of Economic Analysis region which reflects an economic or market region better than State or county boundaries might.

In addition, this approach has several other advantages. The multipliers are easy to use and readily available. The multipliers are from a documented source. The multipliers were developed for use by Federal agencies. The multipliers are well suited for measuring small changes in output.

Disadvantages: The BEA regions are quite large, with only 2-3 per State. The gross output multipliers combine the indirect and induced effects of a direct change in a way that the changes cannot be separated out. Thus, these multipliers will tend to overstate the secondary changes due to a primary change in sales or gross output.

Data Requirements and Sources: The data requirements are Earnings-Gross Output Ratios, a list of sector codes and a list of multipliers for Western BEA regions. These are provided in Appendix 1.

Example of Use of These Multipliers

A $50,000 change in recreationist expenditure is assumed to be split into $15,000 for transportation (Section 53), $25,000 for retail and wholesale trade (Section 54), and $10,000 for services (Section 56). The BEA area is 146 (New Mexico).

Sector	Direct Change in Expenditure	Multiplier	Total Change in Gross Output	Earnings to Output Ratio	Total Change in Earnings or Income
53	$15,000	2.284	$34,260	.311	$10,654
54	$25,000	2.717	$67,925	.513	$34,845
56	$10,000	2.711	$27,110	.487	$13,202

The change in income would be compared with the current income of that BEA area to see how significant the change is.

2. U.S. FOREST SERVICE IMPLAN

General: This is the Forest Service Input-Output Model. The model allows for estimation of direct, indirect, and induced effects in Total Gross Output, employment, and income. This information can be estimated for any county or group of counties in the U.S. The model has a highly disaggregated number of sectors, 472 to be exact. However, the user has the option of combining sectors so as to greatly reduce the number of sectors. The data base is 1977, but the user has the option of updating the data to a more recent year.

At the present time, two versions of IMPLAN are in existence. There is, of course, the nation-wide IMPLAN. This allows the user to enter the change in resource outoputs (recreation visitor days, tons of coal, board feet of timber, etc.) directly. The user then enters the sales value or expenditure per unit output. With these data, the input-output model able to estimate the secondary changes. The user can specify whether he or she wants induced changes as well as indirect changes or not.

The other version of IMPLAN has the sales value or expenditures per unit of output already built into the system. This version is available only for the Forest Service Region 4 (Idaho, Utah, and Nevada). While it is easier to use, this system requires Recreation Visitor Days (RVD's) to be entered in the millions and hence may not be sensitive enough for the small changes in direct outputs likely for most WSA's.

Advantages: For many areas of the country, IMPLAN represents the most up to date and comprehensive input-output model available. The model is being used by the Forest Service to display employment effects of their land management plans. The IMPLAN model allows you to "tailor" build a region by selecting the county or group of counties to be included in the region. The model allows for a wide variety of printed output formats. This allows the information display to be as specific or general as the analyst or decisionmaker requires. The IMPLAN model allows for separation of indirect from induced efforts, again providing the analyst with the choice. For large impacts associated with designation of a WSA, this model will be very useful.

Disadvantages: The primary weakness is that IMPLAN currently is available only at the U.S.D.A.'s Fort Collins Computer Center. While the Forest Service has indicated a desire to share the model, arrangements would have to be made to gain access. This is an institutional problem rather than a technical weakness since the same terminal that is used to access the Honeywell system can be used for the Fort Collins Computer Center.

Another weakness is that the analyst must take the time to learn the IMPLAN system. While this is certainly justified if the impacts under the wilderness program and other programs the analyst deals with are substantial, however, it may not be worthwhile in all cases. Application of IMPLAN also assumes expenditures will be the same in BLM as for Forest Service areas.

Data Requirements: An IMPLAN users manual, a Fort Collins Computer Center phone number, user ID, and password are needed. These will require negotiation between BLM and the Forest Service.

Data Sources: The U.S. Forest Service, Land Management Planning Group, Fort Collins, Colorado, is the data source.

3. COLORADO STATE UNIVERSITY INPUT-OUTPUT MODEL AND MULTIPLIERS

General: Dr. John McKean of Colorado State University, Department of Economics (working on contracts with BLM) has developed the base data for input-output models of 14 counties in Colorado and 11 counties in Wyoming. The reports, in addition, contain the income multipliers (indirect and induced), employment per dollar of total output, and employment multipliers. The data in the reports are relatively recent. In Colorado much of the data are of 1974-1975 vintage. In Wyoming the data are from 1978 to 1979 records.

Advantages: The multipliers are very site specific and are relatively up to date. The entire input-output models could be run for large changes in outputs associated with designation of a WSA. However, for small changes in outputs, the affected sectors could be identified and the respective multipliers utilized directly. The analyst has the opportunity of separating indirect from induced (household consumption) effects.

Disadvantages: A weakness of the model is that the base data and multipliers are only available for parts of Colorado and Wyoming. This could be remedied with more effort between the State Offices in the interested States.

Data Requirements: To use the multipliers, the only requirement is to obtain the multipliers (by sector) for the multi-county area of interest. The data sources will be presented in the next section.

The requirements to run the input-output model simply are access to a terminal, a user ID, and password for the BLM Honeywell Computer System.

Data Sources: Multipliers for the Grand and Jackson County area of Colorado can be found in "An Input-Output Study of the Kremmling Region of Western Colorado" (McKean and Weber 1981a).

Multipliers for the Eagle, Garfield, Mesa, Pitkin, and Summit county region can be found in "An Input-Output Study of the Upper Colorado Main Stem Region of Western Colorado (McKean and Weber 1981b).

Multipliers for the Delta, Eagle, Garfield, Mesa, Moffat, Montrose, Pitkin, Rio Blanco, and Routt county region can be found in "The Economy of Northwestern Colorado: Description and Analysis" (Gray, McKean, and Weber 1981).

Multipliers specific to a subset region of the above counties (Moffat, Routt, and Rio Blanco) can be found in "The Economy of Moffat, Routt, and Rio Blanco Counties" (McKean and Weber 1981c).

In Wyoming, multipliers are currently available for the Albany, Carbon, and Sweetwater County region. They can be found in the Economy of Albany, Carbon, and Sweetwater Counties, Wyoming (McKean and Weber 1981d).

Multipliers for Sheridan, Johnson, Natrone, Converse, Niobara, Weston, Campbell, and Crook, Wyoming will be available in early 1982 from Colorado State University.

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APPENDIX 1. BUREAU OF ECONOMIC ANALYSIS-WATER RESOURCES COUNCIL SUPPORT DATA AND MULTIPLIERS

Earnings-Gross Output Ratios
by WRC Industry

Sector	Earnings to Gross Output	Sector	Earnings to Gross Output	Sector	Earnings to Gross Output
1	.277	20	.028	39	.324
2	.040	21	.056	40	.228
3	.158	22	.069	41	.361
4	.080	23	.124	42	.193
5	.201	24	.132	43	.084
6	.413	25	.118	44	.273
7	.455	26	.132	45	.321
8	.511	27	.138	46	.317
9	.384	28	.097	47	.225
10	.661	29	.040	48	.280
11	.123	30	.083	49	.308
12	.441	31	.032	50	.308
13	.196	32	.136	51	.267
14	.388	33	.051	52	.297
15	.169	34	.220	53	.311
16	.272	35	.076	54	.513
17	.272	36	.238	55	.160
18	.289	37	.260	56	.487
19	.095	38	.239		

WRC Sector Definition

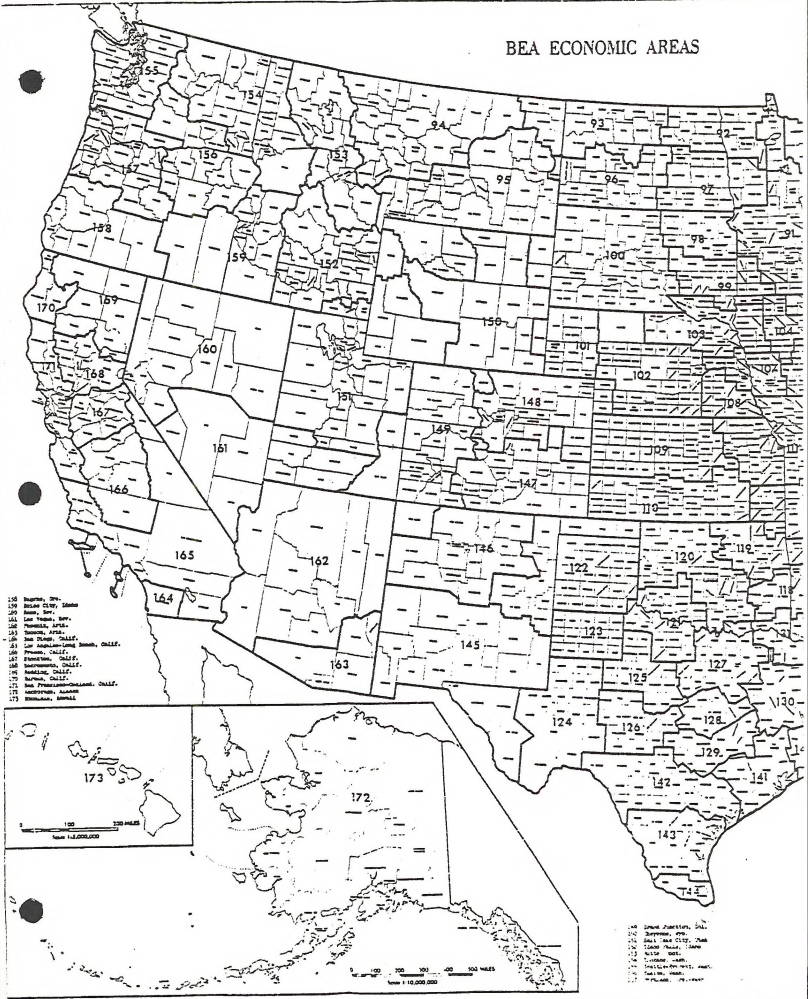
Number	Industry Title	SIC Codes (1958)
1	Dairy farm products	0132, pt. 014, pt. 02
2	Poultry and eggs	0133, pt. 014, pt. 02
3	Meat, animals, and miscellaneous livestock products	0139, pt. 014, 0193, pt. 0729, pt. 02
4	Cotton	0112, pt. 014, pt. 02
5	Food, feed grains, and grass seeds	0113, pt. 0119, pt. 014, pt. 02
6	Tobacco	pt. 0119, pt. 014, pt. 02
7	Fruits and tree nuts	0122, pt. 014, pt. 02
8	Vegetables, sugar, crops	0123, pt. 0119, pt. 014, pt. 02
9	Oil bearing crops	pt. 0119, pt. 014, pt. 02
10	Forest, greenhouse, and nursery products	pt. 0192, pt. 014, pt. 02
11	Forestry and fishery products	074, 081, 082, 084, 086, 09
12	Agricultural forestry and fishery services	071, 0723, 073, pt. 0729, 085, 098
13	Metal mining	10
14	Anthracite mining, bituminous coal and lignite mining	11, 12
15	Oil and gas extraction	13
16	Nonmetallic minerals, except fuels and chem. and fertilizer mineral mining	14 excl. 147
17	Chemical and fertilizer minerals	147
18	General building contractors Heavy construction contractors Special trade contractors	15 16 17
19	Meat products	201
20	Creamery butter	2021

WRC Sector Definition (continued)

Number	Industry Title	SIC Codes (1958)
21	Cheese, natural and processed	2022
22	Condensed and evaporated milk	2023
23	Ice cream and frozen desserts	2024
24	Fluid milk	2026
25	Canned specialties Canned fruits and vegetables	2032 2033
26	Fresh or frozen packaged fish	2036
27	Frozen meats and vegetables	2037
28	Flour and other grain-mill products, cereal prep., rice milling, blended and prepared flour, and wet corn milling	2041, 2043-6
29	Prepared feeds for animals and fowls	2042
30	Cottonseed	2091
31	Oil mills Soybean Vegetable oil mills, nec.	2091-3 2092 2093
32	Animal and marine fats and oils	2094
33	Shortening and cooking oils	2096
34	Other food products	2031, 2034-5, 305, 207, 208, 2095, 2097-9
35	Tobacco manufacturing	21
36	Textile mill prod.; apparel and other textile prod.	22, 23
37	Logging camps and logging contractors	2411
38	Lumber and wood prod., except logging camps and logging contractors and wooden containers	24 except 241, 244

WRC Sector Definition (continued)

Number	Industry Title	SIC Codes (1958)
39	Wooden containers; furniture and fixtures	244, 25
40	Paper and allied products	26
41	Printing, publishing	27
42	Chemicals and allied prod.	28
43	Petroleum and coal prod.	29
44	Rubber and plastics prod. nec.	30
45	Leather and leather prod.	31
46	Stone, clay, and glass prod.	32
47	Primary metal industries	33
48	Fabricated metal prod.	34
49	Machinery, except electrical	35
50	Electrical equip. and supplies	36
51	Transportation equipment	37
52	Ordnance and accessories Instruments, related prod. Misc. mfc. industries	19 38 39
53	Transporation, communication, and utilities	40-49
54	Wholesale and retail trade	50-59
55	Finance, insurance, and real estate	60-67
56	Services	70-89



BEA ECONOMIC AREAS

Industry Specific Gross Output Multipliers and Components by BEA Economic Areas

	094 - Great Falls, Mont.			095 - Billings, Mont.		
WRC Sector	Direct Effect Component	Indirect Effect Component	Gross Output Multiplier	Direct Effect Component	Indirect Effect Component	Gross Output Multiplier
01	.741	.485	2.226	.827	.687	2.514
02	.604	.393	1.997	.844	.702	2.546
03	.812	.533	2.345	.863	.719	2.581
04	--	--	--	--	--	--
05	.521	.338	1.859	.578	.475	2.053
06	--	--	--	--	--	--
07	.720	.471	2.191	.741	.613	2.354
08	.773	.507	2.280	.803	.666	2.469
09	.646	.421	2.067	.681	.562	2.243
10	.872	.573	2.445	.904	.752	2.656
11	.303	.194	1.497	.323	.261	1.584
12	.733	.480	2.213	.753	.624	2.377
13	.354	.227	1.581	.399	.324	1.723
14	--	--	--	.653	.538	2.191
15	.367	.236	1.603	.411	.335	1.746
16	.419	.270	1.689	.487	.398	1.885
17	--	--	--	--	--	--
18	.458	.296	1.754	.545	.447	1.992
19	.857	.564	2.421	.915	.762	2.677
20	--	--	--	.830	.689	2.519
21	--	--	--	.830	.689	2.519
22	--	--	--	--	--	--
23	.437	.281	1.718	.664	.548	2.212
24	.720	.471	2.191	.812	.674	2.486
25	--	--	--	.494	.404	1.898
26	--	--	--	--	--	--
27	--	--	--	--	--	--
28	.664	.433	2.097	.741	.614	2.355
29	.409	.263	1.672	.624	.514	2.138
30	--	--	--	.620	.510	2.130
31	.326	.209	1.535	--	--	--
32	.380	.244	1.624	.640	.528	2.168
33	--	--	--	--	--	--
34	.371	.238	1.609	.511	.419	1.930
35	--	--	--	--	--	--
36	.290	.185	1.475	.326	.263	.1589
37	.399	.256	1.655	.463	.378	1.841
38	.513	.333	1.846	.688	.568	2.256
39	.411	.265	1.676	.476	.389	1.865
40	--	--	--	.342	.277	1.619
41	.484	.313	1.797	.495	.405	1.900
42	.352	.226	1.578	.406	.330	1.736
43	.658	.430	2.088	.725	.600	2.325
44	--	--	--	.377	.306	1.683
45	--	--	--	.711	.587	2.298
46	.599	.390	1.989	.773	.640	2.413
47	.455	.294	1.749	--	--	--
48	.342	.219	1.561	.377	.306	1.683
49	--	--	--	.394	.319	1.713
50	--	--	--	.386	.313	1.699
51	.360	.231	1.591	.454	.370	1.824
52	.412	.265	1.677	.429	.349	1.778
53	.468	.303	1.771	.549	.450	1.999
54	.639	.416	2.055	.667	.550	2.217
55	.387	.248	1.635	.383	.311	1.694
56	.648	.423	2.071	.682	.563	2.245

-- Sector not present in region

Industry Specific Gross Output Multipliers and Components, by BEA Economic Areas

	096 - Bismarck, N.D.			145 - El Paso, Tex.		
WRC Sector	Direct Effect Component	Indirect Effect Component	Gross Output Multiplier	Direct Effect Component	Indirect Effect Component	Gross Output Multiplier
01	.738	.368	2.106	.789	.992	2.781
02	.619	.307	1.926	.715	.897	2.612
03	.811	.406	2.217	.849	1.069	2.918
04	--	--	--	.568	.707	2.275
05	.496	.244	1.740	.618	.771	2.389
06	--	--	--	--	--	--
07	--	--	--	.760	.954	2.714
08	.763	.381	2.144	.821	1.033	2.854
09	.608	.301	1.909	.715	.897	2.612
10	.862	.432	2.294	.915	1.156	3.071
11	.312	.152	1.464	.329	.403	1.732
12	.720	.359	2.079	.751	.944	2.695
13	--	--	--	.496	.615	2.111
14	.600	.298	1.898	.669	.837	2.506
15	.285	.138	1.423	.437	.540	1.977
16	.419	.206	1.625	.501	.622	2.123
17	--	--	--	.504	.626	2.130
18	.433	.212	1.645	.518	.643	2.161
19	.870	.436	2.306	.901	1.138	3.039
20	.691	.344	2.035	--	--	--
21	.616	.306	1.922	--	--	--
22	--	--	--	--	--	--
23	.452	.222	1.674	.535	.665	2.200
24	.728	.363	2.091	.765	.961	2.726
25	--	--	--	.455	.562	2.017
26	--	--	--	--	--	--
27	--	--	--	--	--	--
28	--	--	--	--	--	--
29	.365	.179	1.544	.457	.566	2.023
30	--	--	--	--	--	--
31	--	--		.698	.875	2.573
32	--	--		--	--	--
33	--	--	--	--	--	--
34	.317	.154	1.471	.404	.498	1.902
35	--	--	--	--	--	--
36	.284	.138	1.422	.500	.620	2.120
37	--	--	--	.418	.516	1.934
38	.316	.154	1.470	.519	.645	2.164
39	.378	.185	1.563	.488	.604	2.092
40	--	--	--	.350	.430	1.780
41	.447	.220	1.667	.526	.653	2.179
42	--	--	--	.485	.601	2.086
43	.488	.241	1.729	.741	.930	2.671
44	.335	.163	1.498	.389	.479	1.368
45	--	--	1.498	.435	.537	1.972
46	.543	.268	1.811	.732	.918	2.650
47	--	--	--	.701	.873	2.579
48	.337	.164	1.501	.391	.481	1.872
49	.373	.182	1.555	.432	.534	1.966
50	.360	.176	1.536	.445	.550	1.995
51	.413	.203	1.616	.423	.522	1.945
52	.363	.177	1.540	.443	.548	1.991
53	.468	.230	1.698	.646	.807	2.453
54	.601	.298	1.399	.690	.864	2.554
55	.309	.150	1.459	.425	.525	1.950
56	.610	.302	1.912	.687	.860	2.547

-- Sector not present in region

Industry Specific Gross Output Multipliers and Components, by BEA Economic Areas

	146 - Albuquerque, N.M.			147 - Colorado Springs, Col.		
WRC Sector	Direct Effect Component	Indirect Effect Component	Gross Output Multiplier	Direct Effect Component	Indirect Effect Component	Gross Output Multiplier
01	.568	.815	2.383	.768	.945	2.713
02	.487	.696	2.183	.664	.813	2.477
03	.473	.675	2.148	.826	1.019	2.845
04	.493	.705	2.198	--	--	--
05	.517	.741	2.258	.562	.685	2.247
06	--	--	--	--	--	--
07	.704	1.018	2.722	.734	.901	2.635
08	.751	1.088	2.839	.790	.973	2.763
09	.643	.927	2.570	--	--	--
10	.851	1.236	3.087	.887	1.096	2.983
11	.248	.347	1.595	.304	.364	1.668
12	.628	.905	2.533	.743	.913	2.656
13	.477	.682	2.159	.463	.561	2.024
14	.666	.962	2.628	.671	.822	2.493
15	.409	.582	1.991	.409	.494	1.903
16	.483	.690	2.173	.489	.594	2.083
17	--	--	--	--	--	--
18	.557	.799	2.356	.535	.651	2.186
19	.442	.629	2.071	.882	1.089	2.971
20	--	--	--	.723	.887	2.610
21	--	--	--	.641	.785	2.426
22	--	--	--	--	--	--
23	.449	.640	2.089	.519	.631	2.150
24	.472	.674	2.146	.759	.933	2.692
25	.328	.463	1.791	.474	.575	2.049
26	--	--	--	--	--	--
27	--	--	--	.502	.610	2.112
28	--	--	--	.600	.733	2.333
29	.286	.402	1.688	.462	.559	2.021
30	--	--	--	.477	.578	2.055
31	--	--	--	--	--	--
32	--	--	--	.457	.553	2.010
33	--	--	--	--	--	--
34	.387	.550	1.937	.425	.513	1.938
35	--	--	--	--	--	--
36	.363	.514	1.877	.299	.357	1.656
37	.429	.611	2.040	.385	.464	1.849
38	.648	.934	2.582	.432	.522	1.954
39	.538	.771	2.309	.481	.583	2.064
40	.348	.493	1.841	--	--	--
41	.539	.773	2.312	.553	.674	2.227
42	.389	.552	1.941	.346	.415	1.761
43	.422	.601	2.023	--	--	--
44	.418	.595	2.013	.393	.474	1.867
45	.453	.646	2.099	.450	.544	1.994
46	.694	1.002	2.696	.736	.904	2.640
47	.371	.526	1.897	.568	.693	2.261
48	.395	.562	1.957	.532	.647	2.179
49	.434	.618	2.052	.517	.629	2.146
50	.478	.684	2.162	.545	.664	2.209
51	.416	.592	2.008	.378	.455	1.833
52	.585	.841	2.426	.473	.573	2.046
53	.528	.756	2.284	.488	.592	2.080
54	.702	1.015	2.717	.681	.834	2.515
55	.444	.634	2.078	.408	.491	1.898
56	.700	1.011	2.711	.688	.844	2.532

-- Sector not present in region

Industry Specific Gross Output Multipliers and Components, by BEA Economic Areas

	148 - Denver, Col.			149 - Grand Junction, Col.		
WRC Sector	Direct Effect Component	Indirect Effect Component	Gross Output Multiplier	Direct Effect Component	Indirect Effect Component	Gross Output Multiplier
01	.743	1.306	3.049	.760	.852	2.612
02	.803	1.415	3.216	.639	.713	2.352
03	.690	1.209	2.899	.825	.928	2.753
04	--	--	--	--	--	--
05	.590	1.029	2.619	.583	.649	2.232
06	--	--	--	--	--	--
07	.778	1.369	3.147	.755	.846	2.601
08	.822	1.449	3.271	.812	.912	2.724
09	--	--	--	--	--	--
10	.904	1.598	3.502	.885	.997	2.882
11	.317	.542	1.859	.308	.336	1.644
12	.690	1.210	2.900	.752	.844	2.596
13	.523	.909	2.432	.404	.444	1.848
14	.620	1.084	2.704	.659	.736	2.395
15	.475	.824	2.299	.424	.468	1.892
16	.556	.969	2.525	.476	.527	2.003
17	.515	.895	2.410	.487	.540	2.027
18	.636	1.112	2.748	.517	.573	2.090
19	.718	1.261	2.979	.875	.986	2.861
20	.755	1.327	3.082	.691	.773	2.464
21	--	--	--	--	--	--
22	.710	1.246	2.956	--	--	--
23	.772	1.358	3.130	.478	.528	2.006
24	.693	1.217	2.910	.743	.833	2.576
25	.625	1.093	2.718	.436	.481	1.917
26	--	--	--	--	--	--
27	.680	1.192	2.872	--	--	--
28	.653	1.142	2.795	.696	.779	2.475
29	.639	1.117	2.756	.447	.494	1.941
30	.607	1.061	2.666	.425	.468	1.893
31	--	--	--	--	--	--
32	.695	1.219	2.914	.398	.438	1.836
33	--	--	--	--	--	--
34	.587	1.025	2.612	.410	.452	1.862
35	--	--	--	--	--	--
36	.378	.652	2.030	.390	.429	1.819
37	.402	.694	2.096	.462	.511	1.973
38	.503	.874	2.377	.707	.791	2.498
39	.595	1.040	2.635	.751	.842	2.593
40	.461	.799	2.260	--	--	--
41	.615	1.075	2.690	.506	.561	2.067
42	.470	.815	2.285	.452	.500	1.952
43	.716	1.257	2.973	.702	.785	2.487
44	.515	.896	2.411	.366	.401	.1767
45	.709	1.244	2.952	--	--	--
46	.789	1.388	3.177	--	--	--
47	.436	.754	2.190	.328	.359	1.687
48	.486	.843	2.329	.372	.408	1.780
49	.587	1.024	2.611	.408	.449	1.857
50	.601	1.049	2.650	.493	.546	2.039
51	.472	.819	2.291	.420	.463	1.883
52	.558	.971	2.529	.448	.495	1.943
53	.550	.957	2.507	.531	.589	2.120
54	.717	1.259	2.976	.674	.754	2.428
55	.483	.839	2.322	.406	.447	1.853
56	.750	1.318	3.068	.698	.781	2.479

-- Sector not present in region

Industry Specific Gross Output Multipliers and Components, by BEA Economic Areas

	150 - Cheyenne, Wyo.			151 - Salt Lake City, Utah		
WRC Sector	Direct Effect Component	Indirect Effect Component	Gross Output Multiplier	Direct Effect Component	Indirect Effect Component	Gross Output Multiplier
01	.762	1.163	2.925	.744	.851	2.595
02	.558	.633	2.191	.794	1.214	3.008
03	.814	.934	2.748	.747	1.140	2.887
04	--	--	--	--	--	--
05	.550	.623	2.173	.612	.928	2.540
06	--	--	--	--	--	--
07	--	--	--	.771	1.177	2.948
08	.786	.901	2.687	.821	1.256	3.077
09	--	--	--	--	--	--
10	.883	1.015	2.898	.898	1.377	3.275
11	.320	.357	1.677	.337	.503	1.840
12	.735	.841	2.576	.712	1.084	2.796
13	.442	.498	1.940	.560	.846	2.406
14	.640	.729	2.369	.715	1.090	2.805
15	.358	.401	1.759	.462	.695	2.157
16	.472	.534	2.006	.565	.855	2.420
17	.469	.530	1.999	.533	.804	2.337
18	.505	.572	2.077	.648	.985	2.633
19	.838	.963	2.801	.771	1.178	2.949
20	.638	.728	2.366	.772	1.178	2.950
21	--	--	--	.749	1.143	2.892
22	--	--	--	.650	.987	2.637
23	--	--	--	.689	1.048	2.737
24	.712	.814	2.526	.723	1.101	2.824
25	.309	.345	1.654	.526	.795	2.321
26	--	--	--	--	--	--
27	--	--	--	.592	.898	2.490
28	.708	.810	2.518	.693	1.054	2.747
29	.364	.408	1.772	.710	1.081	2.791
30	--	--	--	.575	.870	2.445
31	--	--	--	.722	1.101	2.823
32	--	--	--	.649	.986	2.635
33	--	--	--	--	--	--
34	.367	.411	1.778	.538	.813	2.351
35	--	--	--	--	--	--
36	.317	.353	1.670	.418	.626	2.044
37	.458	.517	1.975	.761	1.161	2.922
38	.703	.804	2.507	.537	.843	2.400
39	.510	.578	2.099	.577	.873	2.450
40	--	--	--	.378	.566	1.944
41	.486	.549	2.035	.573	.867	2.440
42	.454	.513	1.967	.563	.851	2.414
43	.717	.820	2.537	.739	1.126	2.865
44	--	--	--	.516	.779	2.295
45	.511	.579	2.090	.712	1.085	2.797
46	.635	.724	2.359	.845	1.294	3.139
47	.421	.474	1.895	.668	1.015	2.683
48	.362	.406	1.768	.710	1.081	2.791
49	.408	.458	1.866	.632	.959	2.591
50	.540	.613	2.153	.485	.731	2.216
51	.434	.489	1.923	.549	.830	2.379
52	.394	.442	1.836	.544	.823	2.367
53	.546	.619	2.165	.573	.867	2.440
54	.641	.731	2.372	.684	1.041	2.725
55	.365	.409	1.774	.430	.645	2.075
56	.656	.748	2.404	.718	1.094	2.812

-- Sector not present in region

Industry Specific Gross Output Multipliers and Components, by BEA Economic Areas

WRC Sector	152 - Idaho Falls, Idaho Direct Effect Component	Indirect Effect Component	Gross Output Multiplier	153 - Butte, Mont. Direct Effect Component	Indirect Effect Component	Gross Output Multiplier
01	.817	.664	2.481	.714	.792	2.506
02	.829	.674	2.503	.454	.497	1.951
03	.853	.694	2.547	.795	.885	2.680
04	--	--	--	--	--	--
05	.635	.512	2.147	.528	.580	2.108
06	--	--	--	--	--	--
07	.761	.617	2.378	.714	.793	2.507
08	.825	.671	2.496	.777	.864	2.641
09	--	--	--	.640	.708	2.348
10	.905	.738	2.643	.872	.973	2.845
11	.305	.241	1.546	.299	.323	1.622
12	.763	.619	2.382	.732	.813	2.545
13	.462	.369	1.831	.482	.528	2.010
14	--	--	--	--	--	--
15	--	--	--	.321	.347	1.668
16	.458	.366	1.824	.428	.468	1.896
17	.488	.390	1.878	.465	.510	1.975
18	.526	.422	1.948	.491	.539	2.030
19	.923	.754	2.677	.884	.988	2.872
20	.919	.750	2.669	--	--	--
21	.833	.678	2.511	.604	.666	2.270
22	.755	.612	2.367	--	--	--
23	.772	.626	2.398	.449	.492	1.941
24	.841	.685	2.526	.728	.808	2.536
25	.558	.448	2.006	.424	.463	1.887
26	.368	.292	1.660	--	--	--
27	.594	.478	2.072	--	--	--
28	.616	.497	2.113	--	--	--
29	.660	.534	2.194	--	--	--
30	.620	.500	2.120	--	--	--
31	--	--	--	--	--	--
32	.648	.523	2.171	.388	.423	1.811
33	--	--	--	--	--	--
34	.686	.554	2.240	.350	.380	1.730
35	--	--	--	--	--	--
36	.337	.267	1.604	.307	.332	1.639
37	.445	.355	1.800	.451	.493	1.944
38	.672	.543	2.215	.708	.786	2.494
39	.503	.403	1.906	.603	.666	2.269
40	.322	.255	1.577	.502	.551	2.053
41	.516	.414	1.930	.481	.528	2.009
42	.522	.419	1.941	.389	.424	1.813
43	--	--	--	--	--	--
44	.402	.320	1.722	.394	.429	1.823
45	.734	.595	2.329	--	--	--
46	.600	.483	2.083	.583	.642	2.225
47	.283	.223	1.506	.688	.763	2.451
48	.376	.299	1.675	.354	.385	1.739
49	.406	.323	1.729	.379	.413	1.792
50	.430	.343	1.773	--	--	--
51	.451	.360	1.811	.489	.534	2.025
52	.443	.354	1.797	.421	.460	1.881
53	.500	.401	1.901	.487	.534	2.021
54	.668	.540	2.208	.636	.703	2.339
55	.392	.312	1.704	.349	.378	1.727
56	.673	.544	2.217	.648	.717	2.365

--Sector not present in region

Industry Specific Gross Output Multipliers and Components, by BEA Economic Areas

	154 - Spokane, Wash.			156 - Yakima, Wash.		
WRC Sector	Direct Effect Component	Indirect Effect Component	Gross Output Multiplier	Direct Effect Component	Indirect Effect Component	Gross Output Multiplier
01	.811	.860	2.671	.805	.687	2.492
02	.811	.861	2.672	.821	.702	2.523
03	.852	.906	2.758	.846	.724	2.570
04	--	--	--	--	--	--
05	.533	.558	2.091	.625	.529	2.154
06	--	--	--	--	--	--
07	.747	.790	2.537	.811	.694	2.505
08	.803	.851	2.654	.843	.721	2.564
09	--	--	--	--	--	--
10	.881	.937	2.816	.901	.773	2.674
11	.306	.315	1.621	.303	.252	1.555
12	.779	.825	2.604	.789	.674	2.463
13	.400	.415	1.815	.392	.328	1.720
14	--	--	--	--	--	--
15	.365	.378	1.743	.322	.268	1.590
16	.447	.466	1.913	.429	.360	1.789
17	.459	.478	1.936	--	--	--
18	.546	.572	2.118	.514	.433	1.947
19	.913	.971	2.884	.927	.795	2.722
20	.818	.868	2.686	.825	.705	2.530
21	.812	.862	2.674	--	--	--
22	--	--	--	--	--	--
23	.668	.704	2.372	--	--	--
24	.823	.873	2.696	.830	.709	2.539
25	.506	.529	2.035	.565	.477	2.042
26	--	--	--	--	--	--
27	.588	.618	2.206	.689	.586	2.275
28	.725	.766	2.491	.734	.625	2.359
29	.600	.631	2.231	.638	.541	2.179
30	.575	.604	2.179	.592	.501	2.093
31	--	--	--	--	--	--
32	.620	.652	2.272	.688	.585	2.273
33	--	--	--	.379	.316	1.695
34	.529	.554	2.093	.596	.504	2.100
35	--	--	--	--	--	--
36	.318	.328	1.646	.358	.299	1.657
37	.453	.472	1.925	.450	.378	1.828
38	.703	.743	2.446	.685	.582	2.267
39	.661	.697	2.358	.613	.519	2.132
40	.533	.558	2.091	.565	.478	2.043
41	.602	.633	2.235	.510	.430	1.940
42	.356	.369	1.725	.495	.417	1.912
43	.604	.634	2.238	.200	.164	1.364
44	.389	.403	1.792	.636	.540	2.176
45	.426	.444	1.870	.835	.714	2.549
46	.704	.743	2.447	.658	.559	2.217
47	.742	.785	2.527	.321	.266	1.587
48	.427	.444	1.871	.374	.312	1.686
49	.458	.478	1.936	.413	.346	1.759
50	.462	.481	1.943	.404	.338	1.742
51	.480	.502	1.982	.436	.365	1.801
52	.481	.502	1.983	.482	.405	1.887
53	.484	.505	1.989	.478	.402	1.880
54	.655	.690	2.345	.652	.553	2.205
55	.393	.408	1.801	.377	.315	1.692
56	.668	.704	2.372	.651	.553	2.204

-- Sector not present in region

Industry Specific Gross Output Multipliers and Components, by BEA Economic Areas

	157 - Portland, Ore.-Wash.			158 - Eugene, Ore.		
WRC Sector	Direct Effect Component	Indirect Effect Component	Gross Output Multiplier	Direct Effect Component	Indirect Effect Component	Gross Output Multiplier
01	.813	1.339	3.152	.689	.900	2.589
02	.851	1.404	3.255	.671	.877	2.548
03	.821	1.353	3.174	.678	.886	2.564
04	--	--	--	--	--	--
05	.603	.984	2.587	.480	.620	2.100
06	--	--	--	--	--	--
07	.788	1.297	3.085	.731	.958	2.689
08	.840	1.385	3.225	.772	1.013	2.785
09	--	--	--	--	--	--
10	.910	1.504	3.414	.845	1.112	2.957
11	.361	.580	1.941	.278	.354	1.632
12	.792	1.303	3.095	.705	.922	2.627
13	.504	.818	2.322	.407	.523	1.930
14	.720	1.182	2.902	--	--	--
15	.321	.514	1.835	.295	.376	1.671
16	.540	.879	2.419	.432	.557	1.989
17	--	--	--	--	--	--
18	.707	1.160	2.867	.546	.709	2.255
19	.887	1.464	3.351	.696	.909	2.605
20	.798	1.314	3.112	.662	.865	2.527
21	--	--	--	.619	.807	2.426
22	--	--	--	.534	.692	2.226
23	.725	1.189	2.914	.591	.769	2.360
24	.810	1.334	3.144	.672	.877	2.549
25	.667	1.092	2.759	.423	.545	1.968
26	.890	1.468	3.358	.351	.450	1.801
27	.748	1.229	2.977	.516	.669	2.185
28	.766	1.259	3.025	--	--	--
29	.661	1.082	2.743	.504	.653	2.157
30	--	--	--	--	--	--
31	--	--	--	.653	.852	2.505
32	.757	1.244	3.001	.527	.683	2.210
33	.424	.684	2.106	--	--	--
34	.632	1.034	2.666	.380	.489	1.869
35	--	--	--	--	--	--
36	.490	.795	2.285	.317	.405	1.722
37	.819	1.349	3.166	.442	.571	2.013
38	.772	1.269	3.041	.722	.945	2.667
39	.760	1.250	3.010	.702	.918	2.620
40	.680	1.113	2.793	.513	.664	2.177
41	.740	1.215	2.955	.499	.645	2.144
42	.467	.757	2.224	.328	.419	1.747
43	.296	.473	1.769	.338	.432	1.770
44	.520	.845	2.365	.409	.526	1.935
45	.572	.932	2.504	.430	.554	1.984
46	.768	1.262	3.030	.583	.759	2.342
47	.654	1.070	2.724	.380	.488	1.868
48	.748	1.229	2.977	.386	.495	1.881
49	.691	1.133	2.824	.423	.545	1.968
50	.644	1.053	2.697	.396	.510	1.906
51	.687	1.125	2.812	.387	.497	1.884
52	.578	.943	2.521	.445	.575	2.020
53	.557	.907	2.464	.497	.643	2.140
54	.704	1.154	2.858	.641	.835	2.476
55	.456	.737	2.193	.369	.473	1.842
56	.726	1.191	2.917	.656	.857	2.513

-- Sector not present in region

Industry Specific Gross Output Multipliers and Components, by BEA Economic Areas

	159 - Boise City, Idaho			160 - Reno, Nev.		
WRC Sector	Direct Effect Component	Indirect Effect Component	Gross Output Multiplier	Direct Effect Component	Indirect Effect Component	Gross Output Multiplier
01	.830	.764	2.594	.745	.946	2.691
02	.847	.780	2.627	.571	.719	2.290
03	.865	.797	2.662	.815	1.039	2.853
04	--	--	--	.531	.667	2.198
05	.537	.487	2.024	.571	.718	2.289
06	--	--	--	--	--	--
07	.754	.691	2.445	--	--	--
08	.807	.742	2.549	.799	1.015	2.814
09	--	--	--	--	--	--
10	.883	.814	2.697	.892	1.138	3.030
11	.324	.290	1.614	.294	.363	1.657
12	.757	.694	2.451	.741	.941	2.662
13	.392	.352	1.744	.475	.594	2.069
14	--	--	--	--	--	--
15	--	--	--	.387	.482	1.869
16	.437	.394	1.831	.478	.598	2.076
17	--	--	--	.497	.623	2.120
18	.536	.486	2.022	.515	.647	2.162
19	.923	.851	2.774	.879	1.122	3.001
20	.925	.854	2.779	--	--	--
21	.844	.777	2.621	--	--	--
22	.753	.691	2.444	--	--	--
23	.754	.692	2.446	--	--	--
24	.836	.769	2.605	.730	.925	2.655
25	.553	.502	2.055	--	--	--
26	.346	.310	1.656	--	--	--
27	.623	.568	2.191	--	--	--
28	.774	.710	2.484	--	--	--
29	.596	.542	2.138	.381	.474	1.855
30	.630	.575	2.205	--	--	--
31	--	--	--	--	--	--
32	--	--	--	.335	.415	1.750
33	--	--	--	--	--	--
34	.555	.505	2.060	.377	.469	1.846
35	--	--	--	--	--	--
36	.572	.520	2.092	.317	.392	1.709
37	.455	.411	1.866	.387	.482	1.869
38	.728	.667	2.395	.433	.541	1.974
39	.626	.571	2.197	.461	.576	2.037
40	.340	.304	1.644	--	--	--
41	.509	.461	1.970	.532	.668	2.200
42	.328	.293	1.621	.429	.536	1.965
43	--	--	--	--	--	--
44	.396	.356	1.752	.388	.482	1.870
45	.447	.404	1.851	.450	.563	2.013
46	.587	.535	2.122	.705	.693	2.596
47	.326	.291	1.617	.502	.629	2.131
48	.390	.351	1.741	.448	.559	2.007
49	.410	.369	1.779	.419	.522	1.941
50	.378	.340	1.718	.452	.566	2.018
51	.568	.517	2.085	.381	.474	1.855
52	.448	.405	1.853	.469	.587	2.056
53	.513	.465	1.978	.474	.594	2.068
54	.660	.602	2.262	.691	.875	2.566
55	.422	.381	1.803	.424	.528	1.952
56	.677	.619	2.296	.740	.938	2.678

-- Sector not present in region

Industry Specific Gross Output Multipliers and Components, by BEA Economic Areas

	161 - Las Vegas, Nev.			162 - Phoenix, Ariz.		
WRC Sector	Direct Effect Component	Indirect Effect Component	Gross Output Multiplier	Direct Effect Component	Indirect Effect Component	Gross Output Multiplier
01	.454	.674	2.128	.765	1.249	3.014
02	.312	.458	1.770	.685	1.115	2.800
03	.347	.512	1.859	.799	1.306	3.105
04	.520	.776	2.296	.556	.899	2.455
05	.489	.728	2.217	.587	.951	2.538
06	--	--	--	--	--	--
07	--	--	--	.777	1.267	3.044
08	.752	1.135	2.887	.829	1.357	3.186
09	--	--	--	--	--	--
10	.809	1.224	3.033	.909	1.490	3.399
11	.213	.309	1.522	.314	.499	1.813
12	.536	.801	2.337	.747	1.219	2.966
13	.450	.669	2.119	.533	.862	2.395
14	.645	.969	2.614	.615	.998	2.613
15	.319	.469	1.788	.407	.652	2.059
16	.482	.718	2.200	.529	.855	2.384
17	.491	.731	2.222	.499	.804	2.303
18	.488	.728	2.216	.654	1.062	2.716
19	.317	.466	1.783	.850	1.391	3.241
20	.236	.344	1.580	--	--	--
21	.282	.414	1.696	--	--	--
22	--	--	--	.555	.898	2.453
23	--	--	--	.611	.990	2.601
24	.338	.498	1.836	.752	1.226	2.978
25	--	--	--	.504	.813	2.317
26	--	--	--	--	--	--
27	--	--	--	--	--	--
28	--	--	--	.686	1.117	2.803
29	--	--	--	.527	.851	2.378
30	.244	.356	1.600	.475	.765	2.240
31	--	--	--	.667	1.083	2.750
32	.292	.428	1.720	.498	.803	2.301
33	--	--	--	--	--	--
34	.364	.537	1.901	.518	.835	2.353
35	--	--	--	--	--	--
36	.328	.482	1.810	.380	.608	1.988
37	.338	.498	1.836	.462	.743	2.205
38	.389	.575	1.964	.694	1.129	2.823
39	.454	.674	2.128	.634	1.029	2.663
40	.363	.535	1.898	.409	.654	2.063
41	.527	.787	2.314	.604	.978	2.582
42	.400	.592	1.992	.448	.719	2.167
43	.336	.496	1.832	.257	.405	1.662
44	.400	.593	1.993	.462	.744	2.206
45	.522	.778	2.300	.593	.960	2.553
46	.578	.866	2.444	.793	1.297	3.090
47	.412	.610	2.022	.529	.855	2.384
48	.362	.535	1.897	.554	.895	2.449
49	.402	.596	1.998	.570	.922	2.492
50	.411	.610	2.021	.691	1.124	2.815
51	.421	.624	2.045	.641	1.042	2.683
52	.487	.726	2.213	.687	1.117	2.804
53	.466	.694	2.160	.502	.810	2.312
54	.685	1.030	2.715	.705	1.148	2.853
55	.413	.612	2.025	.457	.735	2.192
56	.770	1.163	2.933	.731	1.191	2.922

-- Sector not present in region

Industry Specific Gross Output Multipliers and Components, by BEA Economic Areas

	163 - Tucson, Ariz.			164 - San Diego, Calif.		
WRC Sector	Direct Effect Component	Indirect Effect Component	Gross Output Multiplier	Direct Effect Component	Indirect Effect Component	Gross Output Multiplier
01	.567	.793	2.360	.519	.837	2.356
02	.466	.648	2.114	.469	.754	2.223
03	.509	.709	2.218	.418	.670	.2088
04	.487	.678	2.165	.509	.820	2.329
05	.491	.684	2.175	.503	.810	2.313
06	--	--	--	--	--	--
07	.708	.996	2.704	.726	1.183	2.909
08	.751	1.059	2.810	.760	1.240	3.000
09	--	--	--	--	--	--
10	.819	1.158	2.977	.821	1.342	3.163
11	.245	.334	1.579	.231	.363	1.594
12	.601	.842	2.443	.563	.910	2.473
13	.487	.678	2.165	.421	.674	2.095
14	--	--	--	--	--	--
15	.384	.530	1.914	.285	.451	1.736
16	.475	.661	2.136	.470	.755	2.225
17	--	--	--	--	--	--
18	.506	.705	2.211	.500	.805	2.305
19	.486	.676	2.162	.374	.596	1.970
20	--	--	--	--	--	--
21	--	--	--	--	--	--
22	--	--	--	--	--	--
23	--	--	--	--	--	--
24	.457	.634	2.091	.390	.623	2.013
25	.280	.383	1.663	.293	.464	1.757
26	--	--	--	--	--	--
27	--	--	--	.346	.550	1.896
28	--	--	--	.350	.558	1.908
29	.271	.370	1.641	.271	.428	1.699
30	--	--	--	--	--	--
31	.367	.506	1.873	--	--	--
32	.341	.470	1.811	.382	.610	1.992
33	--	--	--	--	--	--
34	.357	.492	1.849	.364	.580	1.944
35	--	--	--	--	--	--
36	.327	.450	1.777	.361	.575	1.936
37	--	--	--	--	--	--
38	.332	.457	1.789	.379	.607	1.985
39	.415	.575	1.990	.461	.740	2.201
40	--	--	--	.335	.533	1.868
41	.517	.720	2.237	.545	.880	2.425
42	.340	.468	1.808	.364	.580	1.944
43	.305	.419	1.724	.205	.322	1.527
44	.378	.522	1.900	.394	.630	2.024
45	.420	.582	2.002	.458	.735	2.193
46	.697	.981	2.678	.542	.875	2.417
47	.561	.785	2.346	.350	.558	1.908
48	.392	.542	1.934	.424	.680	2.104
49	.388	.536	1.924	.572	.925	2.497
50	.454	.631	2.085	.563	1.077	2.740
51	.347	.478	1.825	.605	.979	2.584
52	.449	.624	2.073	.515	.830	2.345
53	.463	.643	2.106	.471	.757	2.228
54	.675	.948	2.623	.690	1.122	2.812
55	.405	.561	1.966	.439	.705	2.144
56	.683	.960	2.643	.707	1.149	2.856

-- Sector not present in region

Industry Specific Gross Output Multipliers and Components, by BEA Economic Areas

	165 - Los Angeles-Long Beach, Calif.			169 - Redding, Calif.		
WRC Sector	Direct Effect Component	Indirect Effect Component	Gross Output Multiplier	Direct Effect Component	Indirect Effect Component	Gross Output Multiplier
01	.609	1.467	3.076	.744	.717	2.461
02	.693	1.675	3.368	.597	.572	2.169
03	.472	1.127	2.599	.810	.783	2.593
04	.638	1.539	3.177	.458	.436	1.894
05	.621	1.496	3.117	.503	.479	1.982
06	--	--	--	--	--	--
07	.803	1.950	3.753	.726	.700	2.426
08	.834	2.028	3.862	.780	.754	2.534
09	--	--	--	--	--	--
10	.887	2.160	4.047	.855	.828	2.683
11	.318	.752	2.070	.281	.264	1.545
12	.621	1.498	3.119	.737	.711	2.446
13	.485	1.162	2.647	.343	.324	1.667
14	.753	1.826	3.579	--	--	--
15	.489	1.170	2.659	--	--	--
16	.598	1.441	3.039	.426	.404	1.830
17	.521	1.249	2.770	.454	.431	1.885
18	.759	1.840	3.599	.496	.472	1.968
19	.502	1.203	2.705	.877	.850	2.727
20	.511	1.225	2.736	--	--	--
21	.602	1.449	3.051	--	--	--
22	.581	1.398	2.979	--	--	--
23	.656	1.584	3.240	--	--	--
24	.504	1.207	2.711	.715	.689	2.404
25	.631	1.522	3.153	.409	3.88	1.797
26	.642	1.550	3.192	--	--	--
27	.664	1.603	3.267	--	--	--
28	.525	1.259	2.784	--	--	--
29	.639	1.540	3.179	.383	.363	1.746
30	.481	1.150	2.631	--	--	--
31	.394	.936	2.330	--	--	--
32	.648	1.562	3.210	--	--	--
33	.723	1.751	3.474	--	--	--
34	.646	1.559	3.205	.343	.323	1.666
35	.239	.559	1.798	--	--	--
36	.578	1.391	2.969	.294	.276	1.570
37	.586	1.411	2.997	.443	.420	1.863
38	.564	1.355	2.919	.682	.656	2.338
39	.697	1.685	3.382	.638	.613	2.251
40	.623	1.502	3.125	.390	.369	1.759
41	.733	1.775	3.508	.661	.636	2.297
42	.626	1.510	3.136	.390	.369	1.759
43	.745	1.806	3.551	--	--	--
44	.659	1.592	3.251	.363	.343	1.706
45	.664	1.605	3.269	--	--	--
46	.722	1.747	3.469	.642	.616	2.258
47	.588	1.415	3.003	.310	.291	1.601
48	.650	1.570	3.220	.346	.327	1.673
49	.729	1.767	3.496	.372	.351	1.723
50	.760	1.842	3.602	.406	.385	1.791
51	.774	1.878	3.652	.413	.391	1.804
52	.716	1.733	3.449	.455	.433	1.888
53	.589	1.418	3.007	.480	.457	1.937
54	.724	1.754	3.478	.642	.617	2.259
55	.493	1.179	2.672	.344	.324	1.668
56	.779	1.891	3.670	.661	.636	2.297

-- Sector not present in region

Industry Specific Gross Output Multipliers and Components, by BEA Economic Areas

170 - Eureka, Calif.

WRC Sector	Direct Effect Component	Indirect Effect Component	Gross Output Multiplier
01	.730	.716	2.446
02	.630	.614	2.244
03	.766	.753	2.519
04	.489	.474	1.963
05	.522	.507	2.029
06	--	--	--
07	.736	.723	2.459
08	.790	.776	2.566
09	--	--	--
10	.854	.842	2.696
11	.285	.272	1.557
12	.717	.703	2.420
13	.413	.398	1.811
14	--	--	--
15	.285	.271	1.556
16	.431	.416	1.847
17	--	--	--
18	.492	.477	1.969
19	.813	.800	2.613
20	--	--	--
21	.607	.590	2.196
22	.463	.448	1.911
23	--	--	--
24	.702	.688	2.390
25	--	--	--
26	.279	.266	1.545
27	--	--	--
28	--	--	--
29	.409	.395	1.804
30	--	--	--
31	--	--	--
32	.421	.407	1.828
33	--	--	--
34	.340	.326	1.666
35	--	--	--
36	.335	.321	1.656
37	.442	.427	1.869
38	.690	.675	2.365
39	.788	.775	2.563
40	.434	.419	1.853
41	.499	.484	1.983
42	.300	.286	1.586
43	.314	.300	1.614
44	.359	.344	1.703
45	--	--	--
46	.567	.552	2.119
47	.318	.304	1.622
48	.364	.349	1.713
49	.410	.396	1.806
50	--	--	--
51	.475	.460	1.935
52	.434	.419	1.853
53	.477	.462	1.939
54	.658	.643	2.301
55	.352	.338	1.690
56	.657	.642	2.299

-- Sector not present in region